SPECIFICATIONS AND OTHER BIDDING AND CONTRACT DOCUMENTS

ALAMEDA COUNTY PROJECT #16007
ITD HEADQUARTERS – 13TH STREET RENOVATION
393-13TH STREET
OAKLAND, CALIFORNIA 94612

MANDATORY PRE-BID SITE VISIT AND MEETING
You Must Be Prequalified To Respond To This Bid
Thursday, April 27, 2017 at 10:00am
Location:
393-13th Street, Oakland, CA 94612

ALAMEDA COUNTY GENERAL SERVICES AGENCY
CAPITAL PROGRAMS
1401 LAKESIDE DRIVE, #800
OAKLAND, CALIFORNIA
COUNTY MANAGER CONTACT: Maritza Delgadillo
PHONE: 510-208-9588 FAX: 510-208-3995

Komorous-Towey Architects
410-12th Street, Suite 300
Oakland, CA 94607
PHONE: 510-446-2244 FAX: 510-446-2242

DOCUMENT 00 01 09

SUMMARY BIDDING CALENDAR

NOTICE – THIS SUMMARY IS FOR INFORMATIONAL PURPOSES ONLY. The dates and times listed may not be relied upon or enforced. This summary does not form a part of the contract documents and does not establish contractual obligations.

NOTICE – THIS IS A SUMMARY ONLY AND DOES NOT LIST ALL DATES, TIMES OR TIME PERIODS CONTAINED IN THE BIDDING AND CONTRACT DOCUMENTS. All bidders and contractors must refer to the actual documents for all applicable dates, times and time periods.

Event	Date	Reference
Contract Documents Available	**April 12, 2017**	00 11 16 Notice to Bidders
Mandatory Pre-Bid Conference & Mandatory Site Visit	**April 27, 2017 10:00AM Location: 393 13th Street, Oakland, CA 94612 Parking: There is pay street parking and pay public parking structures in the vicinity 13th and Franklin Street.**	00 11 16 Notice to Bidders
Non-Mandatory Networking Meeting & Non-Mandatory Site Visit.	**April 28, 2017 2:00PM Location: 393 13th Street, Oakland, CA 94612**	00 11 16 Notice to Bidders
Addendum #1 Issue Date (Issue List of Attendees at the Mandatory Pre-Bid Conference)	**April 28, 2017**	00 21 13 Instructions to Bidders
Last Day for GSA to receive any Bidder Questions	**May 1, 2017, 2:00PM**	00 21 13 Instructions to Bidders

Last Day for Receipt of Requests for Substitutions before Receipt of Bids	**May 1, 2017, 2:00PM**	00 21 13 Instructions to Bidders
Addendum #2 Issue Date (Issue Responses to Bidder Questions)	**May 9, 2017**	00 21 13 Instructions to Bidders
Receipt of Bids and Bid Opening	**May 24, 2017, 2:00PM**	00 11 16 Notice to Bidders
Last Day for two lowest Bidders to submit outstanding Bid Documents and ECOP Documentation	**May 26, 2017, 2:00PM** (2 business days following the Bid Opening Date)	00 22 19 Supplementary Instructions to Bidders -Construction Outreach Program
Bid Evaluation Period	**May 26, 2017 to June 1, 2017**	00 21 13 Instructions to Bidders
Notice of Intent to Award	**June 2, 2017**	00 51 13 Notice of Intent to Award
Last Day to Submit Bid Protest	**June 9, 2017, 2:00PM** (5th Business Day from Date of Notice of Intent to Award)	00 21 13 Instructions to Bidders
Estimated Board Award of Contract	**June 20, 2017**	00 51 00 Notice of Award
Notice of Award	**June 20, 2107**	00 51 00 Notice of Award
Last Day to Sign & Submit Contract	**June 27, 2017** (7 Calendar days after Notice of Award)	00 11 16 Notice to Bidders 00 51 00 Notice of Award
Last Day to Submit Post-Award Documents	**June 27, 2017** (7 Calendar days after Notice of Award)	00 21 13 Instructions to Bidders
Last Day to Submit Escrow Bid Documentation	**June 27, 2017** (7 Calendar days after Notice of Award)	00 56 00 Escrow Bid Documentation

Issue Notice to Proceed	**July 6, 2017**	00 55 00 Notice to Proceed
Contract Duration	**287 Calendar Days** (Commencing Contract Award Date to Construction Completion Date)	00 52 13 Agreement Form – Stipulated Sum (Single Prime Contract)
Last Day Contract Duration Begins	**June 20, 2017**	00 55 00 Notice to Proceed
Last Day Contract Duration Ends	**April 2, 2018**	00 55 00 Notice to Proceed
Last Day to Submit Construction Schedule, etc. per Notice to Proceed	**July 20, 2017, 2:00PM** (10th Business Day following Notice to Proceed)	00 55 00 Notice to Proceed
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LIST OF SCHEDULES

SCHEDULES

Project Duration: 287 Calendar Days

Milestones:

Category	Start Date
Contract Documents Available, Issue for Bid	April 12, 2017
Mandatory Pre-Bid Conference & Mandatory Site Visit	April 27, 2017
Bids Due/Bid Opening	May 24, 2017
Notice of Intent to Award	June 2, 2017
Contract Award	June 20, 2017
Contract Start Date	June 20, 2017
Notice to Proceed Date	July 6, 2017
Construction Start Date	July 31, 2017
Construction Completion Date	April 2, 2018
Contract End Date	April 2, 2018

END OF DOCUMENT

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NOTICE TO BIDDERS

1. Notice is hereby given that The County of Alameda General Services Agency ("GSA") Purchasing Department ("County" or "Owner") will receive sealed bids for the following project:

   ITD Headquarters 393-13th Street Renovations (Project Name)

2. Sealed Bids will be received until **2:00 p.m., May 24, 2017**, at 1401 Lakeside Drive, 9th Floor, Oakland, California, at or after which time the bids will be opened and publicly read aloud. Any claim by a bidder of error in its bid must be made in compliance with section 5100 et seq. of the Public Contract Code. Any bid that is submitted after this time shall be non-responsive and returned to the bidder.

3. The Project consists of:

   Tenant Improvements of an existing 4-story building over Basement, including but not limited to: Interiors demolition on all 5 levels of walls, ceilings, concrete flooring, existing finishes, related mechanical, electrical, lighting, plumbing and telecommunications, hazardous materials abatement. Interiors renovation of all 5 levels including new ceiling, wall and floor finishes for new offices, conference rooms, break rooms, new and remodeled toilet rooms; HVAC, plumbing, electrical, telecommunications, security, audio-visual infrastructure; new Loft with structural steel addition to Mezzanine level. Provision and installation of all equipment and fixtures related to lighting, audio-visual, telecommunications, security, plumbing, toilet fixtures & accessories. Water proofing repair work at exterior walls, entries, sidewalk, roof, windows, concrete spall repair & other miscellaneous water proofing repairs.

   The budgetary estimate for the scope of work is **$12,300,000**.

   The time to complete this project is **Two Hundred Eighty-Seven (287)** calendar days.

4. All bids shall be on the Bid Form Document 00 41 13 provided by the County. Each bid must conform to and be responsive to all pertinent Contract Documents, including, but not limited to, the Instructions to Bidders Document 00 21 13 and the Supplementary Instructions to Bidders - Construction Outreach Program Document 00 22 19.

5. Bidders are strongly encouraged to review the Supplementary Instructions to Bidders – Enhanced Construction Outreach Program Document (ECOP) 00 22 19 and to begin their outreach efforts prior to the initial mandatory project job walk. The list of bidders solicited for this project include but are not limited to all those construction contractors

listed in the GSA Small, Local & Emerging Program Vendor Query database located at http://www.acgov.org/sleb_query_app/gsa/sleb/query/slebmenu.jsp .

6. To bid on this Project, the Bidder is required to possess one or more of the following State of California Contractor Licenses:

   B - General Building Contractor
   And all other licenses associated with the Scope of Work

   The Bidder's license(s) must remain active and in good standing throughout the term of the Contract.

7. A bid bond by an admitted surety insurer on the form provided by the County, cash, or a cashier's check or a certified check, drawn to the order of the County of Alameda, in the amount of **ten percent (10%) of the total bid price**, shall accompany the Bid Form, as a guarantee that the Bidder will, **within seven (7) calendar days after the date of the Notice of Award**, enter into a contract with the County for the performance of the services as stipulated in the bid.

8. The successful Bidder shall be required to furnish a **100 % Performance Bond and a 100% Payment Bond** if it is awarded the contract for the Work.

9. The successful Bidder may substitute securities for any monies withheld by the County to ensure performance under the Contract, in accordance with the provisions of section 22300 of the Public Contract Code.

10. The Contractor and all Subcontractors under the Contractor shall pay all workers on all work performed pursuant to this Contract **not less than the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work** as determined by the Director of the Department of Industrial Relations, State of California, for the type of work performed and the locality in which the work is to be performed within the boundaries of the County, pursuant to sections 1770 et seq. of the California Labor Code. Prevailing wage rates are also available from the County or on the Internet at: <http://www.dir.ca.gov>.

11. This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations. The following requirements apply to this bid and contract:

    A. No contractor or subcontractor may be listed on a bid proposal for a public works project (submitted on or after March 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 [with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a)].

B. No contractor or subcontractor may be awarded a contract for public work on a public works project (awarded on or after April 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.

12. The Work performed pursuant to this Contract will be subject to the requirements of the "PROJECT STABILIZATION/COMMUNITY BENEFITS AGREEMENT for the COUNTY OF ALAMEDA" as described in Project Stabilization/ Community Benefit Document 00 73 49. In consideration of the award of a Contract to perform the Work, the Contractor agrees to be party to and bound by the "PROJECT STABILIZATION/COMMUNITY BENEFITS AGREEMENT for the COUNTY OF ALAMEDA". Contractor agrees to execute the "PROJECT STABILIZATION/COMMUNITY BENEFITS AGREEMENT for the COUNTY OF ALAMEDA" Letter of Assent and shall require all of its subcontractors, of whatever tier, to become similarly bound for all work within the scope of this Contract by signing an identical Letter of Assent.

13. A mandatory pre-bid conference and site visit will be held on **April 27, 2017 at 10:00 am at 393-13th Street, Oakland**, California. All participants are required to sign in at the site... The site visit is expected to take approximately **two (2) hours**. If mandatory, failure to attend or arrival after the material start of the meeting will render bid ineligible. There will also be a non-mandatory networking conference held on **April 28, 2017 at 2:00 pm at 393 – 13th Street, Oakland, CA.** This conference is held to help support the efforts of general contractors to find local M/WBE subcontractors to meet their ECOP compliance goals.

14. Contract Documents are available on **April 12, 2017**, and are available for bidders' review at the locations shown on Attachment 1 to this Document.

A. Contract Documents are also available for purchase at East Bay Blue Print (see Attachment 1 of this document section). This fee is non-refundable.

15. The County has found and determined that the following item(s) shall be used on this Project based on the purpose(s) indicated. (Public Contract Code section 3400(b)): A particular material, product, thing, or service is designated by specific brand or trade name for the following purpose(s):

(1) In order to match other products in use on a particular public improvement either completed or in the course of completion.

i. Door Hardware & Locks: see specifications.

ii. Hand Dryer: see specifications.

iii. Toilet Room Accessories: see specifications.

iv. Bike Rack: see specifications.

16. It is County policy to minimize the expenditure of County funds on goods and services produced by any entity which buys, sell, leases or distributes commodities and/or professional services to (1) the government of Burma; or (2) any entity organized under the laws of Burma; or (3) any entity which does business with any private or public entity located in Burma, or conducts operations in Burma. Contractors are urged to comply with the policy in making purchases and subcontracts. (ref. Alameda County, Cal., Adm. Code tit.4, §4.32.050(B),(F))

17. Contractors must comply with County Administrative Code's CONSTRUCTION DEBRIS MANAGEMENT PRACTICES.

18. The County reserves the right to reject any and all bids and/or waive any irregularity in any bid received. If the County awards the Contract, the security of unsuccessful bidder(s) shall be returned **within sixty (60) days from the time the award** is made. Unless otherwise required by law, no bidder may withdraw its bid for **ninety (90) days after the date of the bid opening.**

19. The County shall award the Contract, if it awards it at all, to the lowest responsive responsible bidder based on:

    A. The base bid amount only.

    Determination of the responsible bidder with the lowest responsive bid will also be subject to the terms of the Enhanced Construction Outreach Program Document 00 22 19.

END OF DOCUMENT

ATTACHMENT 1

PLAN ROOM ADVERTISING LIST

☒	1	Bay Area Builders Exchange** 3055 Alvarado Street San Leandro, CA 94577 Phone: (510) 483-8880 ;Fax: (925) 685-3424 Email: planroom@bayareabx.com (This is a merger of Builders Exchange of Alameda County and Contra Costa Builders Exchange 5/18/15.)	☒	2	San Francisco Builders Exchange 850 South Van Ness Avenue San Francisco, CA 94110 Phone: (415) 282-8220 Fax: (415) 821-0363 Email: djohnsonsf@sbcglobal.net
☐	3	Dodge Data and Analytics (Dodge Plan Room, formerly McGraw-Hill Construction Dodge) (Online) 3315 Central Avenue Hot Springs Arkansas (AR) 71913 **(Contact: Gerry McCarthy)** 626-531-6818; Fax: 626-226-1623 Email gerry.mccarthy@construction.com	☒	4	Small Business Exchange 703 Market Street, Suite 1000 San Francisco, CA 94103 Phone: (415) 778-6250 Fax: (415) 778-6255 Email: sbe@sbeinc.com
☒	5	Central California Builders Exchange 1244 N. Mariposa St. Fresno, Ca 93703 Phone (559) 237-1831; Fax (559) 264-2532 Email: megan@cencalbx.com	☒	6	County of Alameda Current Contracting Opportunities Website located at http://www.acgov.org/gsa_app/gsa/purchasing/bid_content/contractopportunities.jsp
☐	7	The Blue Book Building & Construction Network (www.bb-bid.com Online) Contact: Amanda Limitone, Project Communication Specialist Phone: (855) 805-2560, ext.3145; Email: alimitone@thebluebook.com			
☐	8	Reed Construction Data** – Online/Electronic Plan Room 30 Technology Parkway South, Suite 100 Norcross, GA 30092-2912 Phone: (770) 209-3396 Jeannie Kwan; Fax (Addenda only): (800) 303-8629; Fax (Notice to Bidders/IFB): (800) 642-2437; Email (addenda only): docprocessing@reedbusiness.com *-Send requests to advertise to above address/fax/phone-* Local Email: jeannie.kwan@reedbusiness.com (EPR: http://www.reedconstructiondata.com)			
☒	9	East Bay Blue Print & Supply Co. 1745 Fourteenth Ave Oakland, CA 94606 Phone: (510) 261-2990 - Sandy Petty Email: ebbp@eastbayblueprint.com			
☒	10	Construction Bidboard, Inc.(Online)** 11622 El Camino Real, Suite 100 San Diego, CA 92130 800-479-5314 phone; 619-688-0585 fax **(Contact Dorothy Ellithorpe** dellithorpe@ebidboard.com) Alternate: planroom@ebidboard.com***** ebidboard@gmail.com			

* Plans/Specs must be sent to individual Plan Rooms to ensure posting at that location.

**Construction trade journals specified for alternate bidding procedures for projects between $25,000 and $125,000 minimum advertising requirements. County policy is to post all construction projects over $25,000 in all listed Plan Rooms, Press/Newspaper Publications and Local Chambers of Commerce/Trade Organizations

DOCUMENT 00 21 13

INSTRUCTIONS TO BIDDERS

Bidders shall follow the instructions in this document, and shall submit all documents, forms, and information required for consideration of a Bid.

County will evaluate information submitted by the apparent low Bidder and, if incomplete or unsatisfactory to County, Bidder's bid may be rejected at the sole discretion of County.

1. Bids are requested for a general construction contract, or work described in general, for the following project ("Project" or "Contract"):

   ITD Headquarters 393-13th Street Renovations (Project Name)

2. County will receive sealed Bids from Bidders as stipulated in the Notice to Bidders Document 00 11 16.

3. Bidders must submit Bids on Bid Form 00 41 13 and all other required County forms. Bids not submitted on the County's required forms shall be deemed non-responsive and shall not be considered. Additional sheets required to fully respond to requested information are permissible.

4. Bidders must supply all information required by each Bid Document. Bids must be full and complete. County reserves the right in its sole discretion to reject any Bid as non-responsive as a result of any error or omission in the Bid. Bidders must complete and submit all of the following documents with Bid Form Document 00 41 13 :

   a. Bid Bond on Bid Security Form Document 00 43 13 or other security
   b. Designated Subcontractors List Document 00 43 36
   c. Site-Visit Certification Document 00 45 01, if a site visit was required
   d. Non-Collusion Affidavit Document 00 45 13
   e. Construction Outreach Program Certifications as required by Supplementary Instructions to Bidders – Enhanced Construction Outreach Program Document 00 22 19.
   f. Completed Debarment Form, Document 00 52 13.1.

5. Bidders must submit with their Bids cash, a cashier's check or a certified check payable to County, or a Bid Bond of not less than ten percent (10%) of amount of base Bid, plus all additive alternates. Required form of corporate surety, Bid Security Form, is provided by County and must be used and fully completed by Bidders choosing to provide a Bid Bond as security. The Surety on Bidder's Bid Bond must be an insurer admitted in the State of California and authorized to issue surety bonds in the State of California. Bids submitted without necessary bid security will be deemed non-responsive and will not be considered.

6. If Bidder to whom Contract is awarded shall for **SEVEN (7)** calendar days after the date of the Notice of Award, fail or neglect to enter into Contract and submit required bonds, insurance certificates, and all other required documents, County may deposit Bid Bond, cash, cashier's check, or certified check for collection, and proceeds thereof may be retained by County as liquidated damages for failure of Bidder to enter into Contract, in the sole discretion of County. It is agreed that calculation of damages the County may suffer as a result of Bidder's failure to enter into the Contract would be extremely difficult and impractical to determine and that the amount of the Bidder's required bid security shall be the agreed and conclusively presumed amount of damages.

7. Bidders must submit with the Bid the Designated Subcontractors List for those subcontractors who will perform any portion of Work, including labor, rendering of service, or specially fabricating and installing a portion of the Work or improvement according to detailed drawings contained in the plans and specifications, in excess of one half of one percent (0.5%) of total Bid. Failure to submit this list when required by law shall result in Bid being deemed non-responsive and the Bid will not be considered.

8. If a mandatory pre-bid conference and site visit ("Site Visit") is requested as referenced in the Instructions to Bidders, then Bidders must submit the Site-Visit Certification with their Bid. County will transmit to all prospective Bidders of record such Addenda as County in its discretion considers necessary in response to questions arising at the Site Visit. Oral statements shall not be relied upon and will not be binding or legally effective. Addenda issued by the County as a result of the Site Visit, if any shall constitute the sole and exclusive record and statement of the results of the Site Visit.

9. Bidders shall submit the Non-Collusion Affidavit with their Bids. Bids submitted without the Non-Collusion Affidavit shall be deemed non-responsive and will not be considered.

10. Bids shall be clearly written without erasure or deletions. County reserves the right to reject any Bid containing erasures or deletions.

11. Bidders shall not modify Bid Form 00 41 13 or qualify their Bids. Bidders shall not submit to the County a scanned, re-typed, word-processed, or otherwise recreated version of Bid Form 00 41 13 or other County-provided document.

12. The successful Bidder and all its subcontractors shall pay all workers on all work performed pursuant to this Contract not less than the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work as determined by the Director of the Department of Industrial Relations, State of California, for the type of work performed and the locality in which the work is to be performed within the boundaries of the County, pursuant to sections 1770 et seq. of the California Labor Code.

13. Submission of Bid signifies Contractor agreement to be party to and bound by the "PROJECT STABILIZATION/COMMUNITY BENEFITS AGREEMENT for the COUNTY OF ALAMEDA". Contractor agrees to execute the "PROJECT STABILIZATION/COMMUNITY BENEFITS AGREEMENT for the COUNTY OF ALAMEDA" Letter of Assent and shall require all of its subcontractors, of whatever tier, to become similarly bound for all work within the scope of this Contract by signing an identical Letter of Assent.

14. Submission of Bid signifies careful examination of Contract Documents and complete understanding of the nature, extent, and location of Work to be performed. Bidders must complete the tasks listed below as a condition to bidding, and submission of Bid shall constitute the Bidder's express representation to County that Bidder has fully completed the following:

    a. Bidder has visited the Site and has examined thoroughly and understood the nature and extent of the Contract Documents, Work, Site, locality, actual conditions, as-built conditions, and all local conditions and federal, state and local laws, and regulations that in any manner may affect cost, progress, performance, or furnishing of Work or that relate to any aspect of the means, methods, techniques, sequences, or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto;

    b. Bidder has conducted or obtained and has understood all examinations, investigations, explorations, tests, reports, and studies that pertain to the subsurface conditions, as-built conditions, underground facilities, and all other physical conditions at or contiguous to the Site or otherwise that may affect the cost, progress, performance, or furnishing of Work, as Bidder considers necessary for the performance or furnishing of Work at the Contract Sum, within the Contract Time, and in accordance with the other terms and conditions of Contract Documents, including specifically the provisions of the General Conditions; and no additional examinations, investigations, explorations, tests, reports, studies, or similar information or data are or will be required by Bidder for such purposes;

    c. Bidder has correlated its knowledge and the results of all such observations, examinations, investigations, explorations, tests, reports, and studies with the terms and conditions of the Contract Documents;

    d. Bidder has given County prompt written notice of all conflicts, errors, ambiguities, or discrepancies that it has discovered in or among the Contract Documents and the actual conditions, and the written resolution thereof by County is acceptable to Bidder;

    e. Bidder has made a complete disclosure in writing to County of all facts bearing upon any possible interest, direct or indirect, that Bidder believes any

representative of County or other officer or employee of County presently has or will have in this Contract or in the performance thereof or in any portion of the profits thereof;

f. Bidder must, prior to bidding, perform the work, investigations, research, and analysis required by this document and that Bidder represents in its Bid Form 00 41 13 and the Agreement that it performed prior to bidding. Bidders are charged with all information and knowledge that a reasonable bidder would ascertain from having performed this required work, investigation, research, and analysis. Bid prices must include entire cost of all work "incidental" to completion of the Work.

g. Conditions Shown on the Contract Documents: Information as to underground conditions, as-built conditions, or other conditions or obstructions, indicated in the Contract Documents, e.g., on Drawings or in Specifications, has been obtained with reasonable care, and has been recorded in good faith. However, County only warrants, and Bidder may only rely, on the accuracy of limited types of information.

(1) As to above-ground conditions or as-built conditions shown or indicated in the Contract Documents, there is no warranty, express or implied, or any representation express or implied, that such information is correctly shown or indicated. This information is verifiable by independent investigation and Bidder is required to make such verification as a condition to bidding. In submitting its Bid, Bidder shall rely on the results of its own independent investigation. In submitting its Bid, Bidder shall not rely on County-supplied information regarding above-ground conditions or as-built conditions.

(2) As to any subsurface condition shown or indicated in the Contract Documents, Bidder may rely only upon the general accuracy of actual reported depths, actual reported character of materials, actual reported soil types, actual reported water conditions, or actual obstructions shown or indicated. County is not responsible for the completeness of such information for bidding or construction; nor is County responsible in any way for any conclusions or opinions of Bidder drawn from such information; nor is County responsible for subsurface conditions that are not specifically shown (for example, County is not responsible for soil conditions in areas contiguous to areas where a subsurface condition is shown).

h. Conditions Shown in Reports and Drawings Supplied for Informational Purposes: Reference is made to the document entitled Geotechnical Data, and the document entitled Existing Conditions Information, for identification of:
(1) Subsurface Conditions: None existing; and

(2) Physical Conditions: Those drawings of physical conditions in or relating to existing surface structures at or contiguous to the Site that has been utilized by Architect in preparing the Contract Documents.

(3) These reports and drawings are **not** Contract Documents and, except for any "technical" data specifically identified in Existing Conditions Information, Bidder may not in any manner rely on the information in these reports and drawings. Subject to the foregoing, Bidder must make its own independent investigation of all conditions affecting the Work and must not rely on information provided by County.

15. Bidders may examine any available "as-built" drawings of previous work by giving County reasonable advance notice. County will not be responsible for accuracy of "as-built" drawings. The document entitled Existing Conditions Information applies to all supplied "as-built" drawings.

16. Copies of the general prevailing rates of per diem wages for each craft, classification, or type of worker needed to execute the Contract, as determined by Director of the State of California Department of Industrial Relations, are on file at the County's principal office. Prevailing wage rates are also available from the County or on the internet at (http://www. dir.ca.gov)

17. All questions about the meaning or intent of the Contract Documents are to be directed in writing, including by e-mail, to County. Interpretations or clarifications considered necessary by County in response to such questions will be issued in writing by Addenda faxed, mailed, or delivered to all parties recorded by County as having received the Contract Documents. Questions received less than **TEN (10)** business days prior to the date for opening Bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

18. Addenda may also be issued to modify other parts of the Contract Documents as deemed advisable by County.

19. Each Bidder must acknowledge each Addendum in its Bid Form 00 41 13 by number or its Bid shall be considered non-responsive. Addenda shall be part of the Contract Documents. A complete listing of Addenda may be secured from County.

20. Bids shall be based on products and systems specified in Contract Documents or listed by name in Addenda. County is not responsible and/or liable in any way for a Bidder's damages and/or claims related, in any way, to that Bidder's basing its bid on any requested substitution that County has not approved. Bidders and materials suppliers who submit requests for substitutions prior to the award of the Contract must do so in writing and in compliance with Public Contract Code section 3400. All requests must comply with the following:

a. County must receive any request for substitution a minimum of **TEN (10)** business days prior to bid opening.

b. Requests for substitutions shall contain sufficient information to assess acceptability of product or system and impact on Project, including, without limitation, the requirements specified in the Special Conditions and the Specifications. Insufficient information shall be grounds for rejection of substitution.

c. Approved substitutions shall be listed in Addenda. County reserves the right not to act upon submittals of substitutions until after bid opening.

d. Substitutions may be requested after Contract has been awarded only if indicated in and in accordance with requirements specified in the Special Conditions and the Specifications.

21. All Bids must be sealed, and marked with name and address of the Bidder and the Project Number, Bid number, Bid package, and time of bid opening. Bids will be received as indicated in the Notice to Bidders.

a. Mark envelopes with the name of the Project.

b. Bids must be submitted at the place and by date and time shown in the Instructions to Bidders.

c. Bids must contain all documents as required herein.

22. Bids will be opened at or after the time indicated for receipt of bids.

23. This Contract may include alternates. Alternates are defined as alternate products, materials, equipment, systems, methods, or major elements of the construction that may, at the County's option and under terms established in the Contract and pursuant to section 20103.8 of the Public Contract Code, be selected for the Work. County shall award the Contract, if it awards it at all, to the lowest responsive responsible bidder based on the criteria as indicated in these contract documents.

24. Time for Completion: County may issue a Notice to Proceed within **NINETY (90)** calendar days from the date of the Notice of Award. Once Contractor has received the Notice to Proceed, Contractor shall complete the Work within the period of time indicated in the Contract Documents.

a. In the event that County desires to postpone issuing the Notice to Proceed beyond the 90-day period above, it is expressly understood that with reasonable notice to the Contractor, County may postpone issuing the Notice to Proceed.

b. It is further expressly understood by Bidder that Contractor shall not be entitled to any claim of additional compensation as a result of the postponement of the issuance of the Notice to Proceed beyond the 90-day period. If the Contractor believes that a postponement of issuance of the Notice to Proceed will cause a hardship to the Contractor, the Contractor may terminate the Contract. Contractor's termination due to a postponement beyond this 90-day period shall be by written notice to County within **TEN (10)** calendar days after receipt by Contractor of County's notice of postponement.

c. It is further understood by Bidder that in the event that Contractor terminates the Contract as a result of postponement by County, County shall only be obligated to pay Contractor for the Work that Contractor had performed at the time of notification of postponement and which County had in writing authorized Contractor to perform prior to issuing a Notice to Proceed.

d. Should the Contractor terminate the Contract as a result of a notice of postponement, County shall have the authority to award the Contract to the next lowest responsive responsible bidder.

25. The Bidder to whom Contract is awarded shall execute and submit the following documents by 5:00 p.m. of the **SEVENTH (7TH)** calendar day following the date of the Notice of Award. Failure to properly and timely submit these documents entitles County to reject the bid as non-responsive.

a. Agreement: To be executed by successful Bidder. Submit four (4) copies, each bearing an original signature.

b. Escrow of Bid Documentation: This must include all required documentation. See the document Escrow of Bid Documentation for more information.

c. Performance Bond (100%): On the form provided in the Contract Documents and fully executed as indicated on the form.

d. Payment Bond (100%) (Contractor's Labor and Material Bond): On the form provided in the Contract Documents and fully executed as indicated on the form.

e. Insurance Certificates and Endorsements as required.

f. Workers' Compensation Certification.

g. Prevailing Wage and Related Labor Requirements Certification.

h. Hazardous Materials Certification.

i. Contractor's Safety Plan specifically adapted for the Project.

j. Executed "PROJECT STABILIZATION/COMMUNITY BENEFITS AGREEMENT for the COUNTY OF ALAMEDA" Letter of Assent

26. Any Bid protest by any Bidder regarding any other Bid must be submitted in writing to the County's GSA–Office of Acquisition Policy, ATTN: Contract Compliance Officer, located at 1401 Lakeside Drive, 10th Floor, Oakland, CA 94612, Fax: (510) 208-9720, before 5:00 p.m. of the FIFTH (5th) business day following the date of issuance of the Notice of Intent to Award, not the date received by the Bidder. A Bid protest received after 5:00 p.m. is considered received as of the next business day.

a. The Bid protest must contain a complete statement of the reasons and facts for the protest.

b. The protest must refer to the specific portions of all documents that form the basis for the protest.

c. The protest must include the name, address, email address, fax number and telephone number of the person representing the protesting party.

d. The County Agency/Department will notify all bidders of the protest as soon as possible.

e. Upon receipt of written protest, GSA–Office of Acquisition Policy, or designee, will review and evaluate the protest and issue a written decision. The GSA–Office of Acquisition Policy, may, at its discretion, investigate the protest, obtain additional information, provide an opportunity to settle the protest by mutual agreement, and/or schedule a meeting(s) with the protesting Bidder and others (as appropriate) to discuss the protest. The decision on the bid protest will be issued at least ten (10) business days prior to the Board hearing or GSA award date.

f. The decision will be communicated by e-mail, fax, or US Postal Service mail, and will inform the bidder whether or not the recommendation to the Board of Supervisors or GSA in the Notice of Intent to Award is going to change. A copy of the decision will be furnished to all Bidders affected by the decision. As used in this paragraph, a Bidder is affected by the decision on a Bid protest if a decision on the protest could have resulted in the Bidder not being the apparent successful Bidder on the Bid.

g. The decision of the GSA-Office of Acquisition Policy on the bid protest may be appealed to the Auditor-Controller's Office of Contract Compliance & Reporting (OCCR) located at 1221 Oak St., Room 249, Oakland, CA 94612, Fax: (510) 272-6502 unless the OCCR determines that it has a conflict of interest in which case an alternate will be identified to hear the appeal and all steps to be taken by OCCR will be performed by the alternate. The Bidder whose Bid is the subject of

the protest, all Bidders affected by the GSA-Office of Acquisition Policy's decision on the protest, and the protestor have the right to appeal if not satisfied with the GSA-Office of Acquisition Policy's decision. All appeals to the Auditor-Controller's OCCR shall be in writing and submitted within five (5) business days following the issuance of the decision by the GSA-Office of Acquisition Policy, not the date received by the Bidder. An appeal received after 5:00 p.m. is considered received as of the next business day. An appeal received after the FIFTH (5th) business day following the date of issuance of the decision by the GSA-Office of Acquisition Policy shall not be considered under any circumstances by the GSA or the Auditor-Controller OCCR.

h. The appeal shall specify the decision being appealed and all the facts and circumstances relied upon in support of the appeal.

i. In reviewing protest appeals, the OCCR will not re-judge the proposal(s). The appeal to the OCCR shall be limited to review of the procurement process to determine if the contracting department materially erred in following the Bid or, where appropriate, County contracting policies or other laws and regulations.

j. The appeal to the OCCR also shall be limited to the grounds raised in the original protest and the decision by the GSA-Office of Acquisition Policy. As such, a Bidder is prohibited from stating new grounds for a Bid protest in its appeal. The Auditor-Controller (OCCR) shall only review the materials and conclusions reached by the GSA-Office of Acquisition Policy or department designee, and will determine whether to uphold or overturn the protest decision.

k. The Auditor’s Office may overturn the results of a bid process for ethical violations by Procurement staff, County Selection Committee members, subject matter experts, or any other County staff managing or participating in the competitive bid process, regardless of timing or the contents of a bid protest.

l. The decision of the Auditor-Controller’s OCCR is the final step of the appeal process. A copy of the decision of the Auditor-Controller’s OCCR will be furnished to the protestor, the Bidder whose Bid is the subject of the Bid protest, and all Bidders affected by the decision.

m. The County will complete the Bid protest/appeal procedures set forth in this paragraph before a recommendation to award the Contract is considered by the Board of Supervisor or GSA.

n. The procedures and time limits set forth in this paragraph are mandatory and are each Bidder's sole and exclusive remedy in the event of Bid Protest. A Bidder’s failure to timely complete both the Bid protest and appeal procedures shall be deemed a failure to exhaust administrative remedies. Failure to exhaust administrative remedies, or failure to comply otherwise with these procedures,

shall constitute a waiver of any right to further pursue the Bid protest, including filing a Government Code Claim or legal proceedings.

27. A responsive bid is a solicited bid that has been determined to be in conformance with the conditions, completion or delivery requirements, and specifications detailed in the solicitation for bid. Responsive bids are those submitted on time; contain complete information, and required submittals and/or supporting documentation.

28. A responsible bidder is defined by the California Public Contract Code section 1103 as "a bidder who has demonstrated the attribute of trustworthiness, as well as quality, fitness, capacity, and experience to satisfactorily perform this public works contract."

29. County reserves the right to reject any or all bids, including without limitation the right to reject any or all nonconforming, non-responsive, unbalanced, or conditional bids, to re-bid, and to reject the bid of any bidder if County believes that it would not be in the best interest of County to make an award to that bidder, whether because the bid is not responsive or the bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by County. County also reserves the right to waive inconsequential deviations not involving price, time, or changes in the Work. For purposes of this paragraph, an "unbalanced bid" is one having nominal prices for some work items and/or enhanced prices for other work items.

30. Discrepancies between written words and figures, or words and numerals, will be resolved in favor of the figures or numerals.

31. Prior to the award of Contract, County reserves the right to consider the responsibility of the Bidder. County may conduct investigations as County deems necessary to assist in the evaluation of any bid and to establish the responsibility, including, without limitation, qualifications and financial ability of Bidders, proposed subcontractors, suppliers, and other persons and organizations to perform and furnish the Work in accordance with the Contract Documents to County’s satisfaction within the prescribed time.

END OF DOCUMENT

DOCUMENT 00 22 19

ENHANCED CONSTRUCTION OUTREACH PROGRAM (ECOP)

GENERAL

1. PURPOSE

1.1 It is the express purpose of the Enhanced Construction Outreach Program (ECOP) to encourage the participation in the County of Alameda, General Services Agency (GSA) capital projects of

- Minority Owned Business Enterprise (MBE),
- Woman Owned Business Enterprise (WBE),
- Local Business Enterprise (LBE) and
- Small Local Business Enterprise (SLBE)

And to ensure that all contracting firms receive an equal opportunity to bid and receive work for this project. The ECOP encourages the inclusion of small businesses in this contract in accordance with Public Contract Code § 2002.

1.2 By submitting a bid, Bidders acknowledge and agree to all Document 00 22 19 provisions contained herein.

1.3 In the event of conflict between the terms of this Section 00 22 19 and the PROJECT STABILIZATION / COMMUNITY BENEFITS AGREEMENT for the COUNTY OF ALAMEDA, the terms of the PROJECT STABILIZATION / COMMUNITY BENEFITS AGREEMENT for the COUTY OF ALAMEDA shall take priority.

2. APPLICATION

2.1 The provisions outlined in this Section 00 22 19 apply to this contract for the construction of the above-referenced project. This project is funded solely with local dollars, and these provisions shall apply to all work performed under any contract awarded as a result of this competitive process.

2.2 To be considered for a contract award, any bidder who fails to meet all ECOP goals identified herein shall be required to demonstrate to the satisfaction of the County that all good faith efforts (GFEs) were made in accordance with the criteria listed in Section 7.9, GFE 1-9. Failure of the bidder to demonstrate a good faith effort may result in the bid being deemed non-responsive.

3. 3 DEFINITIONS

3.1 LOCAL BUSINESS ENTERPRISE (LBE)

3.1.1 For the purposes of this program, a Local Business Enterprise means a business that is a firm or dealer with fixed offices located in, and having a street address within the County and holds a valid business license issued by the County or a city within the County for at least 6 months prior to the date upon which a request for sealed bids or proposals is issued.

3.2 MINORITY OR WOMEN BUSINESS ENTERPRISE (MWBE)

3.2.1 For the purposes of this program, an MWBE is a Small Business Enterprise (SBE), as that term is defined by the State of California, that meets both of the following criteria:

3.2.1.1 At least 51 percent of the business is owned by one or more minority persons or women, or in the case of any business whose stock is publicly held, at least 51 percent of the stock is owned by one or more minority persons or women; and

3.2.1.2 Whose management and daily business operations are controlled by one or more minority persons or women.

3.2.2 An MWBE must be certified as such by local agencies identified or recognized by the County as having effective certification programs. When the State of California SBE definition is met, validation of the current certification by one of the following local agencies must be provided with the bid response:

Bay Area Rapid Transit (BART)
The (CPUC) Supplier Clearinghouse
Western Regional Minority Supplier Development Council (WRMSDC)
Women's Business Enterprise National Council (WBENC)

3.3 MINORITY PERSON

3.3.1 Minority person, for purposes of this section, means Black Americans, Hispanic Americans, Native Americans (including American Indians, Eskimos, Aleuts and Native Hawaiians), Asian-Pacific Americans (including persons whose origins are from Japan, China, the Philippines, Vietnam, Korea, Samoa, Guam, the United States Trust Territories of the Pacific, Northern Marianas, Laos, Cambodia and Taiwan).

3.4 SMALL BUSINESS ENTERPRISE (SBE)

3.4.1 For the purposes of this program, an SBE meets the current State of California definition of a small business, which is one that:

3.4.1.1 Must be independently owned and operated;

3.4.1.2 Cannot be dominant in its field of operation;

3.4.1.3 Must have its principal office located in California;

3.4.1.4 Must have its owners (or officers in the case of a corporation) domiciled in California; and

3.4.1.5 Together with its affiliates, be either:

3.4.1.5.1 A business with 100 or fewer employees, and an average annual gross receipts of $14 million or less over the previous three tax years, or

3.4.1.5.2 A manufacturer with 100 or fewer employees.

3.4.1.6 An SBE must be certified or recognized as such by organizations whose certification is accepted by the California Department of General Services or by local agencies identified by the County of Alameda to have effective certification programs. Validation of the current certification by one of the following local agencies must be provided with the bid response:

Alameda County Transportation Commission (Alameda CTC)
California Department of General Services (DGS)
Port of Oakland
and, when the State SBE definition is met, Alameda County (SLEB certification)

3.5 SMALL LOCAL BUSINESS ENTERPRISE (S/LBE)

3.5.1 For the purposes of this program, a Small Local Business Enterprise is defined by the County of Alameda and means a business that meets the SBE definition above, and is a firm or dealer with fixed offices located in, and having a street address within the County, and holds a valid business license issued by the County or a city within the County.

4. ENHANCED CONSTRUCTION OUTREACH PROGRAM (ECOP) GOALS

4.1 MBE PARTICIPATION SUBCONTRACTING – 15% GOAL

4.1.1 The MBE element of the ECOP program shall include subcontractors, manufacturers, suppliers and truckers in calculating achievement of the MBE goal. Any contractor who fails to meet the MBE goals described herein must demonstrate to the satisfaction of the County of Alameda that a good faith effort was made to meet these goals in order to be considered for a contract award.

4.1.1.1 The County shall further require that in order to be awarded a contract, a prime contractor must show that a good faith effort was made to provide at least 15% of the total contract amount to MBE subcontractors, manufacturers, suppliers, and truckers.

4.1.1.2 The MBE goals must be achieved by the use of MBE subcontractors, manufacturers, suppliers, and/or truckers. If the Contractor plans to perform all the work with the Contractor's own forces, the goal will still apply and must be achieved by the use of suppliers, manufacturers, and/or truckers.

4.1.1.3 A certified MBE prime contractor **may not** apply the percentage of the prime contractor's work toward meeting the goals as set forth above. An MBE subcontractor meeting the definition of both an MBE and a WBE **may not** be used to achieve both MBE and WBE required goals. The percentage of MBE firms utilized for the project described herein can only be applied to either MBE or WBE required goals. For purposes of meeting the MBE goals for this project, each participating MBE must be identified as an MBE.

4.1.1.4 Prime contractors are strongly encouraged to sub-contract with S/LBE certified MBEs to meet the goals.

4.2 WBE PARTICIPATION SUBCONTRACTING – 5% GOAL

4.2.1 The WBE element of the ECOP program shall include subcontractors, manufacturers, suppliers and truckers in calculating achievement of the WBE goal. Any contractor who fails to meet the WBE goals described herein must demonstrate to the satisfaction of the County of Alameda that a good faith effort was made to meet these goals in order to be considered for a contract award.

4.2.1.1 The County shall further require that in order to be awarded a contract; a prime contractor must show that a good faith effort was made to provide at least 5% of the total contract amount to WBE subcontractors, manufacturers, suppliers, and/or truckers.

4.2.1.2 The WBE goals must be achieved by the use of subcontractors, manufacturers, suppliers, and/or truckers. If the Contractor plans to perform all the work with the Contractor's own forces, the goal will still apply and must be achieved by the use of manufacturers, suppliers, and/or truckers.

4.2.1.3 A certified WBE prime contractor **may not** apply the percentage of the prime contractor's work toward meeting the goals as set forth above. A WBE subcontractor meeting the definition of both an MBE and a WBE **may not** be used to achieve both the MBE and WBE required goals. The percentage of WBE firms utilized for the project described herein can only be applied to either MBE or WBE required goals. For purposes of meeting the WBE goals for this project, each participating WBE must be identified as a WBE.

4.2.1.4 Prime contractors are strongly encouraged to sub-contract with S/LBE certified WBEs to meet the goals.

4.3 LBE PARTICIPATION GOALS –60% GOAL

4.3.1 The LBE element of the ECOP program shall include subcontractors, manufacturers, suppliers and/or truckers in calculating achievement of the LBE goal. Any contractor who fails to meet the LBE goals described herein must demonstrate to the satisfaction of the

County of Alameda that a good faith effort was made to meet these goals in order to be considered for a contract award.

4.3.1.1 The County shall further require that in order to be awarded a contract, a prime contractor must show that a good faith effort was made to provide at least 60% of the total contract amount to an LBE.

4.3.1.2 The prime contractor may count a portion or all of its work towards meeting the goal and/or the LBE goal may be achieved by the use of subcontractors, manufacturers, suppliers, and/or truckers.

4.4 S/LBE PARTICIPATION - 20% GOAL

4.4.1 The S/LBE element of the ECOP program shall include subcontractors, manufacturers, suppliers and/or truckers in calculating achievement of the S/LBE goal. Any contractor who fails to meet the S/LBE goals described herein must demonstrate to the satisfaction of the County of Alameda that a good faith effort was made to meet these goals in order to be considered for a contract award.

4.4.1.1 The County shall further require that in order to be awarded a contract; a prime contractor must show that a good faith effort was made to provide at least 20% of the total contract amount to an S/LBE.

4.4.1.2 The prime contractor may count a portion or all of its work towards meeting the goal and/or the S/LBE goal may be achieved by the use of subcontractors, manufacturers, suppliers, and/or truckers. For purposes of meeting this goal, the 20% S/LBE participation may also be counted toward achieving the 60% LBE participation goal and/or a part of the prime contractor LBE participation.

5. SMALL BUSINESS ENTERPRISE 5% BID PREFERENCE

5.1 Prime contractors who are certified small local businesses (S/LBE) shall be eligible to receive a 5% bid preference. Prime contractors that subcontract with certified small local businesses (S/LBE) (in accordance with the Public Contract Code 2002) for a minimum 40% of the contract amount will also be eligible to receive this 5% bid preference. This bid preference shall be applied by multiplying the total Base Bid amount by .95 to determine the bid amount for comparison purposes.

6. HIRING OF LOCAL APPRENTICES, YOUTH, UNEMPLOYED AND UNDEREMPLOYED RESIDENTS (FOR PROJECTS OVER $125K, BUT UNDER $1M)

PURPOSE

6.1 The County of Alameda, General Services Agency (GSA), Technical Services Department (TSD) strongly encourages the hiring of local apprentices, youth, unemployed and under-employed County residents to complete the work required for this project. Those firms that can demonstrate the ability and willingness to provide jobs required to complete this project to local apprentices, youth, unemployed and underemployed County residents should include such evidence in their bid response.

7. GOOD FAITH EFFORTS, ECOP PACKAGE SUBMITTALS, AND EVALUATION PROCEDURES

7.1 It is required that bidders exercise a good faith effort to secure the participation, as set forth in the specifications, of M/W/S/LBE subcontractors, manufacturers, suppliers and/or truckers on the project. Achievement of the ECOP goals shall constitute prima facie evidence of a Good Faith Effort (GFE). The failure of any bidder to make a good faith effort to achieve the specified participation of M/W/S/LBE subcontractors, manufacturers, suppliers and/or truckers shall be grounds for determining that the bid is non-responsive.

7.2 Upon request from GSA, the two responsible bidders with the lowest responsive bids must submit to the Project Manager documentation to support the ECOP goals met, and the GFEs made. The documentation submitted by each bidder shall be referred to as the ECOP Package.

7.3 ECOP bid submittal evaluation will initiate following GSA's determination of the two (2) responsible bidders who submitted the lowest responsive bids and their submission of the ECOP Package, which shall include, but not be limited to, ECOP Form 101A, 101B, 102A, 102B and 102C (provided separately as Excel fillable forms) and supporting documentation verifying ECOP goals met and GFEs made. The ECOP Package is to be submitted by the two (2) responsible bidders who submitted the lowest responsive bids to GSA no later than 2:00 p.m. on the second business day following notification and request by GSA.

7.3.1 The individual dollar amounts to be subcontracted to the M/W/S/LBE listed in the bidder's proposal will be listed on the S/LBE Participation Information ECOP Forms 101A and 101B and the M/WBE Subcontractor Participation Information ECOP Forms 102A, 102B

7.3.2 ECOP Forms 101A, 101B, 102A 102B, 102C (Excel fillable forms), signature page and supporting documentation shall be delivered to the assigned Project Manager.

7.4 After the bids are opened, the M/W/S/LBE subcontractors, manufacturers, suppliers and/or truckers who bid to the two (2) responsible bidders with the apparent lowest responsive bids are required to provide the amounts of their bids to the County for the purposes of verification. This information shall be certified by a principal of the subcontracting firm. To the extent permitted by law, the information provided by the subcontractors, manufacturers, suppliers and/or truckers will be treated as proprietary, and will be solely for the use of County staff or its agents.

7.5 Each ECOP Package will be reviewed and evaluated by GSA or its agents within approximately five (5) business days of receipt unless additional time is needed to verify the submittals. Bidders must meet all the ECOP goals ***OR*** make all the GFEs (see section 7.9) in order for their bid to be deemed responsive.

7.6 The ECOP Package must be complete, submitted on a CD or flash drive, and contain legible supporting documents:

7.6.1 ECOP Forms 101A, 101B, 102A,102B and 102C to be completed electronically and submitted on a CD or flash drive along with the hard copy signature page and supporting documentation.

7.6.2 Supporting certification documentation for the prime contractor and each subcontractor, manufacturer, supplier and/or trucker M/W/S/LBEs submitted in the order they are listed on the ECOP forms **must be submitted as hardcopy**

7.6.2.1 To be considered towards meeting the ECOP goals bidders must submit:

7.6.2.1.1 Acceptable certifying documentation for the prime contractor and its subcontractors, manufacturers, suppliers and/or truckers, as applicable (for example, local business license with proof of issue and expiration date, certification letters with expiration date).

7.6.2.1.2 Evidence that manufacturers, suppliers, and/or truckers are providing goods or services to subcontractors (for example, letter of intent, agreement)

7.6.3 Documents evidencing those good faith efforts that were made, submitted in the order listed in the table below with the corresponding item number (1-9) noted on each document.

7.6.4 Evidence of M/W/S/LBE participation (copies of bids, agreements, etc.) for all listed subcontractors, manufacturers, suppliers, and/or truckers that are *not* directly contracting with them (for example, material suppliers to subcontractors).

7.7 GSA reserves the right, as it may deem appropriate and necessary, to contact the two responsible bidders who submitted the apparent two lowest responsive bids during the evaluation process for clarification and/or submission of additional ECOP Goals or GFE documentation.

7.8 ECOP GOALS / GOOD FAITH EFFORTS REQUIRED

Listed in the table (below) are examples of acceptable documentation to support a determination that ECOP goals have been met

	ECOP GOALS	EXAMPLES OF ACCEPTABLE DOCUMENTATION
1	**60% Local Business Enterprise (LBE)** LBE participation may consist of the Prime Contractor and Subcontractors and may count towards the LBE, SBE, MBE and/or WBE ECOP goals.	• Business license issued by the County of Alameda or a City within the County of Alameda and proof of date issued (which is at least 6 months prior to the date bids were solicited). OR • Certification letter from an acceptable certifying agency* showing a local address and issuance/expiration dates.
2	**20% Certified Small Business Enterprise (SBE)** Certified SBEs **must be** Local (S/LBE) to be considered. S/LBE participation may consist of the Prime Contractor and Subcontractors and may count towards the LBE, SBE, MBE and/or WBE ECOP goals. An SBE meets the LBE definition above and the current State definition of a small business that is <100 employees and <$14 Million annual gross revenues (over the last three years).	• Same as LBE *PLUS* • Current certification document or letter with SBE designation*
3	**15% Minority-Owned Business Enterprise (MBE) Subcontractors** MBEs are defined per PCC 2000(e)(1), (e)(2) and (f) and are not required to be LBEs. An MWBE may count towards only MBE or WBE participation (not both); however, a local MBE may count towards both LBE and S/LBE ECOP goals. An MBE is a minority-owned business certified by one of the agencies listed below. An MBE can also be an SBE or LBE for purposes of meeting the SBE or LBE subcontracting goals, but an MBE cannot also be considered a WBE.**	• Current certification document, letter, etc., with MBE designation**
4	**5% Woman-Owned Business Enterprise (WBE) Subcontractors** WBEs are defined per PCC 2000(e)(1), (e)(2) and (f) and are not required to be LBEs. An MWBE may count towards only MBE or WBE participation (not both); however, a local WBE may count both towards the LBE and S/LBE ECOP goals. A WBE is a minority-owned business certified by one of the agencies listed below. A WBE can also be an SBE or LBE for purposes of meeting the SBE or LBE subcontracting goals, but a WBE cannot also be considered an MBE.**	• Current certification document, letter, etc., with WBE designation**

* SBE certification from the following agencies is accepted: Alameda County Transportation Commission (Alameda CTC), California Department of General Services (DGS, Port of Oakland, *and* when the State SBE definition is met, Alameda County (SLEB certification).

** When the State SBE definition is met MWBE certification from the following agencies is accepted:

Bay Area Rapid Transit (BART), the (CPUC) Supplier Clearinghouse, Western Regional Minority Supplier Development Council (WRMSDC), and Women's Business Enterprise National Council (WBENC).

7.9 The examples of GFE Indicators listed in the table below and suggested samples and are not meant to be mandatory or exclusionary. Other documentation may be acceptable as long as it evidences a GFE. For additional information regarding the ECOP Package submittals contact the GSA Contract Compliance Officer listed in Section IV below.

Required Good Faith Effort Indicators	Examples of Acceptable Documentation
1. The bidder attended mandatory pre-solicitation or pre-bid meetings that were scheduled by the local agency to inform all bidders of the ECOP requirements for the project for which the contract will be awarded.	• Copy of pre-bid meeting sign-in sheet (which is e-mailed to attendees and available on County Current Contracting Opportunities website listed below). The name of the firm must be listed. http://www.acgov.org/gsa_app/gsa/purchasing/bid_content/contractopportunities.jsp
2. The bidder identified and selected specific items of the project for which the contract will be awarded to be performed by M/W/S/LBEs to provide an opportunity for participation by those enterprises.	• Copy of advertisements, certified letters, successfully completed faxes and/or other notices to M/W/S/LBEs with selected specific items identified.
3. The bidder advertised, not less than ten (10) calendar days before the date the bids are opened, in one or more local daily or weekly newspapers, trade association publications, minority or trade-oriented publications, or trade journals for M/W/S/LBEs that are interested in participating in the project.	• Copy of advertisements placed showing publication name and date, and dated receipts. • Dated receipt with ad copy.

4. The bidder provided written notice of his or her interest in bidding on the contract to the number of M/W/S/LBEs required to be notified by the project specifications not less than ten (10) calendar days prior to the opening of bids. The bidder may utilize the list of certified local business enterprises in the on-line County Small Local Emerging Business (SLEB) Vendor Query System located at http://www.acgov.org/sleb_query_app/gsa/sleb/query/slebmenu.jsp. The minimum number of M/W/S/LBE firms required to be notified is three (3) for each item of the project selected to be performed by a M/W/S/LBE, where an M/W/S/LBE subcontractor has not been secured for that item.	• Copy of dated notice, complete distribution list(s) and evidence of distribution (proof of faxes, e-mails sent etc.) • Undelivered faxes do not count toward the effort to meet the minimum requirement • Trades and specialties, in addition to M/W/S/LBE designation, must be clearly identified to meet the minimum requirement by using certification letter or source documentation
5. The bidder followed up initial solicitations of interest by contacting the enterprises to determine with certainty whether the enterprises were interested in performing specific items of the project.	• Successfully completed telephone log containing specific dates, name of caller, person contacted and comments (i.e., why not bidding, information sent to/date)
6. The bidder provided interested M/W/S/LBEs with information about the plans, specifications, and requirements for the selected subcontracting or material supply work.	• Copy of published advertisements, letters, successfully completed faxes, etc. with M/W/S/LBE name/contact information including the required information or directions on how to obtain it and the date the information was provided • Agenda, meeting notes, etc. including specific topics discussed, M/W/S/LBE firm names and contact persons in attendance that received information, and the location and date information was provided
7. The bidder requested assistance from local and small business and minority and women community organizations; local and small, minority and women contractor groups, local, state, or federal M/W/S/LBE assistance offices, or other organizations that provide assistance in recruitment and placement of M/W/S/LBEs.	• Copy of dated written request and response (letter, successfully completed fax, e-mail, etc.) • Or 2nd written request to follow-up, if needed. Phone log is not acceptable.

8. The bidder negotiated in good faith with the M/W/S/LBEs and did not unjustifiably reject as unsatisfactory bids prepared by any M/W/S/LBEs as determined by GSA	• Copies or list of all bids and a spreadsheet listing all bids with firm name, contact person, bid items(s), bid price, M/W/S/LBE classification, and comments re-selection or rejection • M/W/S/LBE bids accepted and included in bid response
9. Where applicable, the bidder advised and made efforts to assist interested M/W/S/LBEs in obtaining bonds, lines of credit, or insurance required by either the GSA or the contractor.	• Copy of advertisements or other notices with specifics referencing willingness to assist M/W/S/LBEs • Agenda, meeting notes including presenter's name and title, specific topics discussed, handouts etc., name of M/W/S/LBE firms in attendance, contact persons who received advice, location, and

7.10 The performance by a bidder of the GFE Indicators specified in the table above shall create a rebuttable presumption, affecting the burden of producing evidence, that a bidder has made a good faith effort to comply with the goals and requirements relating to participation by M/W/S/LBEs established pursuant to Section 4 herein.

8. JOINT VENTURES

8.1 Whenever a joint venture occurs involving either a prime or non-prime (for example, subcontractors, manufacturers, suppliers, and truckers) M/W/S/LBE firm at any level of contracting, trucking, manufacturing, or supplying, the prime contractor shall provide the County with a full account of the nature of ownership interests, the basis for creation of the joint venture, and the particular financial participation and administrative responsibilities of the interested parties. In evaluating the prime contractor's effort, the M/W/S/LBE percentage that is to be attributed to a joint venture shall be determined by multiplying the percentage of the total contract amount that is to be performed by the joint venture times the percentage of actual financial participation in the joint venture represented by the M/W/S/LBE business.

9. NONDISCRIMINATION

9.1 Purpose

9.1 The Contractor shall comply with the Americans with Disabilities Act and Title VII of the Civil Rights Act of 1964 and shall not, in regard to any position for which an employee or applicant for employment is qualified, discriminate against any employee or applicant for employment because of race, creed, color, disability, sex, sexual orientation, political affiliation, or by any other non-merit factors be otherwise subjected to discrimination. The Contractor shall apply the ECOP that ensures applicants are employed, and that employees are treated during employment without regard to their race, age, religion, Vietnam Era Veteran's status, political affiliation, or any other non-merit factors. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other terms of

compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

9.2 Contractor shall, in all solicitations or advertisements for employees placed on behalf of the County, state that all qualified applicants will receive consideration for employment without regard to race, creed, color, disability, sex, sexual orientation or national origin, age, religion, Vietnam Era Veteran's status, political affiliation, or any other non-merit factors.

SECTION II

CONTRACT COMPLIANCE REQUIREMENTS

1. APPLICATION

1.1 The following provisions shall apply to all contracts subject to the provisions of Section I and/or Section IV.

2. ALAMEDA COUNTY CONTRACT COMPLIANCE SYSTEM

2.1 Alameda County utilizes the Elation Systems contract compliance application as part of its commitment to assist contractors to comply with certain legal and contractual requirements. The Elation Systems, a secure web-based computer system, was implemented to monitor compliance and to track and report M/W/S/LBE participation in County contracts.

2.2 The prime contractor and all participating local and M/W/S/LBE subcontractors awarded contracts as a result of the bid process for this project are required to use the Elation System to submit ECOP information including, but not limited to, weekly certified payrolls, monthly progress payment reports and other information related to M/W/S/LBE participation. Use of the Elation System, support and training is available at no charge to prime and subcontractors participating in County contracts.

2.3 Upon contract award:

2.3.1 The County will provide contractors and subcontractors participating in any contract awarded as a result of this bid process, a code that will allow them to register and use the Elation System free of charge.

2.3.2 Contractors should schedule a representative from their office/company, along with each of their subcontractors, to attend Elation Systems training.

2.3.2.1 Free multi-agency Elation Systems one-hour training sessions require reservations and are held monthly in the Pleasanton, California area.

2.4 It is the Contractor's responsibility to ensure that they and their subcontractors are registered and trained as required to utilize Elation Systems.

2.4.1 For systems support visit Elation Systems online at http://www.elationsys.com/ or contact them at (925) 924-0340.

2.4.2 If you have questions regarding the utilization of the Elation Systems, please contact the Project Manager.

3. MEETINGS

3.1 After the award of the contract and prior to beginning work, the General Services Agency may hold a pre-construction conference at which a representative of the Contractor and of each subcontractor must attend. As it becomes necessary during the course of the contract, the General Services Agency may call meetings of the Contractor and pertinent subcontractors.

4. INFORMATION AND RECORDS

4.1 For the purposes of determining compliance with this program, the Contractor shall provide the County with access to all records and documents that relate to M/W/S/LBE participation. To the extent permitted by applicable law, proprietary information will be safeguarded.

4.2 The Contractor must submit the following information to the General Services Agency on Alameda County approved forms. All subcontractor submittals must be through the prime contractor.

4.2.1 S/LBE Participation Information and M/WBE Subcontractor Participation Information, (ECOP Forms 101A,101B, 102A, and 102B provided separately as Excel fillable forms) submitted no later than 2:00 p.m. on the second business day following notification and request by GSA.

4.2.2 Checklist for Review of Good Faith Efforts (ECOP Form 102C (also provided separately) submitted no later than 2:00 p.m. on the second business day following notification and request by GSA.

5. SUBSTITUTION OF M/W/S/LBE FIRMS

5.1 Substitution of other **firms** (subcontractors at any level, manufacturers, suppliers and/or truckers) for those listed in the proposal on the sheet entitled M/WBE Subcontractor Participation Information or S/LBE Participation Information shall not be made without prior approval of the County, and shall be in accordance with State or Federal law where applicable.

SECTION III

NON-COMPLIANCE WITH ECOP

1. APPLICATION

9.3 The following provisions shall apply to all contracts subject to the provisions of Section I and/or Section IV.

2. DETERMINATION OF NON-COMPLIANCE

9.4 During the performance of the contract, if the General Services Agency has reason to believe or finds that the Contractor has not met the ECOP requirements in the contract, the Director of the General Services Agency (or the Director's designee) shall hold a meeting with the Contractor for the purpose of determining whether the Contractor is out of compliance. If after the meeting the Contractor is found to be out of compliance, the Contractor will be notified of a public hearing. The public hearing will be held before the Board of Supervisors with a minimum five calendar-day notice given to the Contractor. If the Board of Supervisors finds that there has been a violation, the County will notify the Contractor in writing of the sanctions to be imposed by the Board.

3. SANCTIONS

9.5 A finding at the public hearing that there has been a violation of the ECOP requirements of the contract shall be cause for the Board of Supervisors to impose any or all of the following sanctions:

9.5.1 Withhold an additional ten percent (10%) of all further contract progress payments until the Contractor provides evidence satisfactory to the Board of Supervisors that the condition of noncompliance has been corrected.

9.5.2 Suspend the contract until such time as the Contractor provides evidence satisfactory to the Board of Supervisors that the condition of noncompliance has been corrected.

9.5.3 Terminate the contract and collect appropriate damages from the Contractor.

9.5.4 Declare that the Contractor is not a responsible bidder~~,~~ and is ineligible to make bids on future County contracts for a stated period of time or until the Contractor can demonstrate to the satisfaction of the Board of Supervisors that the violation has been corrected.

SECTION IV

1. OUTREACH

1.1 To promote the ECOP goals and assist contractors and subcontractors in their efforts to develop the relationships they may require to meet the ECOP goals for this project, the County will

1.1.1 E-mail the Notice to Bidders to vendors in the County Vendor Database and other sources. Advertise the project once a week for at least 2 consecutive weeks in a newspaper of general circulation in the county where the project is located, trade organizations and chambers of commerce, and plan rooms. Notice of this project will also be posted on the County Current Contracting Opportunities and Calendar of Events websites (see website URL addresses below).

1.1.2 Incorporate a networking and informational component in the mandatory bid walk/site visit.

1.1.3 Provide information about the project, the ECOP, and other current and upcoming projects at the bid conference/networking meeting.

1.1.4 E-mail the list of attendees from the mandatory bid walk to each attendee when issuing the first Addendum for the Project and post the attendance and first Addendum on the Current Contracting Opportunities website.

2. CONTRACTOR RESOURCES

The following sources may be contacted for assistance in soliciting M/W/S/LBE participation:

Asian American Contractors Association
Juliana Choy Sommer, President
(415) 642-1818
www.aaca-sf.com

Western Regional Minority Supplier Development Council (WRMSDC) –
MBE certifications only
80 Swan Way, Suite 245
Oakland, CA 94621
(510) 686-2555
www.wrmsdc.org

Women's Business Enterprise National Council (WBENC)
WBE certifications only – www.wbenc.org

Visit the following County of Alameda GSA websites for

CERTIFIED SMALL LOCAL VENDORS	http://www.acgov.org/sleb_query_app/gsa/sleb/query/slebresultlist.jsp?smEmInd=C
CURRENT CONTRACT OPPORTUNITIES	http://www.acgov.org/gsa_app/gsa/purchasing/bid_content/contractopportunities.jsp
UPCOMING CONTRACT OPPORTUNITIES	http://www.acgov.org/gsa_app/gsa/purchasing/bid_content/futurecontractopportunities.jsp
CALENDAR OF EVENTS	http://www.acgov.org/calendar_app/DisplayListServlet?site=Internet&ag=GSA&ty=PUR
COUNTY OF ALAMEDA HOME PAGE	http://www.acgov.org/index.htm

BIDDER INFORMATION AND ACCEPTANCE

(Submit hardcopy of this completed page along with all hardcopy ECOP supporting documentation.)

The undersigned has read and agrees to the Supplementary Instructions to Bidders – Enhanced Construction Outreach Program, Document 00 22 19 of the Bid packet and declares that the ECOP Forms 101A, 101B, 102A, 102B and 102C (Excel Fillable Forms provided separately) have been completed accurately by the Prime Firm submitting the bid.

Official Name of Bidder: _____

Street Address Line 1: _____

Street Address Line 2: _____

City: _____ State: _____ Zip Code: _____

Webpage: _____

Type of Entity / Organizational Structure (check one):

- ☐ Corporation
- ☐ Limited Liability Partnership
- ☐ Limited Liability Corporation
- ☐ Other: _____
- ☐ Joint Venture
- ☐ Partnership
- ☐ Non-Profit / Church

Jurisdiction of Organization Structure: _____

Date of Organization Structure: _____

Federal Tax Identification Number: _____

Primary Contact Information:

Name / Title: _____

Telephone Number: _____ Fax Number: _____

E-mail Address: _____

SIGNATURE: _____

Name and Title of Signer: _____

Dated this _____ day of _____ 20_____

DOCUMENT 00 31 19

EXISTING CONDITIONS INFORMATION

1. Summary

This document describes existing conditions at or near the Project, and use of information available regarding existing conditions. This document is **not** part of the Contract Documents. See General Conditions for definition(s) of terms used herein.

2. Reports and Information on Existing Conditions

2.1. Documents providing a general description of the Site and conditions of the Work may have been collected by County its consultants, contractors, and tenants. These documents may include previous contracts, contract specifications, tenant improvement contracts, as-built drawings, utility drawings, and information regarding underground facilities.

2.2. Information regarding existing conditions may be inspected at the County offices or the Construction Manager's offices, if any, and copies may be obtained at cost of reproduction and handling upon Bidder's agreement to pay for such copies. These reports, documents, and other information are **not** part of the Contract Documents.

2.3. Information regarding existing conditions may also be included in the Project Manual, but shall **not** be considered part of the Contract Documents.

2.4. The reports and other data or information regarding existing conditions and underground facilities at or contiguous to the Project are the following:

2.4.1. Original Construction Drawings dated 1950 available in digital form for bidders' review at East Bay Blue Print & Supply Company as noted in item 14 of the Notice to Bidders Document section 00 11 16.

2.4.2. Tenant Improvement Drawings including Architectural, Mechanical, Electrical, Plumbing and Fire Protection dated 2000 available in digital form for bidders' review at East Bay Blue Print & Supply Company as noted in item 14 of the Notice to Bidders Document section 00 11 16.

3. Use of Information

3.1. Information regarding existing conditions was obtained only for use of County and its consultants, contractors, and tenants for planning and design and is **not** part of the Contract Documents.

3.2. County does not warrant, and makes no representation regarding, the accuracy or thoroughness of any information regarding existing conditions. Bidder represents and

agrees that in submitting a bid it is not relying on any information regarding existing conditions supplied by County.

3.3. Under no circumstances shall County be deemed to warrant or represent existing above-ground conditions, as-built conditions, or other actual conditions, verifiable by independent investigation. These conditions are verifiable by Contractor by the performance of its own independent investigation, which Contractor must perform as a condition to bidding, and Contractor should not and shall not rely on this information or any other information supplied by County regarding existing conditions.

3.4. Any information shown or indicated in the reports and other data supplied herein with respect to existing underground facilities at or contiguous to the Project may be based upon information and data furnished to County by the County's employees and/or consultants or builders of such underground facilities or others. County does not assume responsibility for the completeness of this information, and Bidder is solely responsible for any interpretation or conclusion drawn from this information.

3.5. County shall be responsible only for the general accuracy of information regarding underground facilities, and only for those underground facilities that are owned by County , and only where Bidder has conducted the independent investigation required of it pursuant to the Instructions to Bidders, and discrepancies are not apparent.

4. Investigations/Site Examinations

4.1. Before submitting a Bid, each Bidder is responsible for conducting or obtaining any additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and underground facilities) at or contiguous to the Site or otherwise, that may affect cost, progress, performance, or furnishing of Work or that relate to any aspect of the means, methods, techniques, sequences, or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto or that Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of the Contract Documents.

4.2. On request, County will provide each Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies, as each Bidder deems necessary for submission of a Bid. Bidders must fill all holes and clean up and restore the Site to its former condition upon completion of its explorations, investigations, tests, and studies. Such investigations and Site examinations may be performed during any and all Site visits indicated in the Notice to Bidders and only under the provisions of the Contract Documents, including, but not limited to, proof of insurance and obligation to indemnify against claims arising from such work, and County's prior approval.

END OF DOCUMENT

DOCUMENT 00 41 13

BID FORM – STIPULATED SUM (SINGLE-PRIME CONTRACT)

To: The County of Alameda

From: _____
(Proper Name of Bidder)

The undersigned declares that the Contract Documents including, without limitation, the Notice to Bidders Document 00 11 16, the Instructions to Bidders Document 00 21 13 and the Supplementary Instructions to Bidders – Construction Outreach Program Document 00 22 19 have been read and agrees and proposes to furnish all necessary labor, materials, and equipment to perform and furnish all work in accordance with the terms and conditions of the Contract Documents, including, without limitation, the Drawings and Specifications of Bid for:

PROJECT: **ITD Headquarters 393-13th Street Renovations**

("Project" or "Contract") and will accept in full payment for that Work the following total lump sum amount, all taxes included:

BASE BID		$ _____
_____	**Dollars**	**$ _____**
TOTAL BID AMOUNT		

Additive/Deductive Alternates:

Alternate #1

_____	dollars	$ _____
(Re-Roofing) Additive		

A1ternate #2

_____ dollars $ _____
(Provide alternate Demountable Wall System at all Floors)
Deductive

Alternate #3

_____ dollars $ _____
(Provide Streaming Devices at 1st Floor)
Additive

Alternate #4

_____ dollars $ _____
(Provide Wireless Presentation Devices at 2nd Floor)
Additive

Alternate #5

_____ dollars $ _____
(Provide lighting for Public Art Wall)
Additive

Alternate #6

_____ dollars $ _____
(Upgrade all Wireless Presentation Devices)
Additive

Descriptions of alternates are primarily scope definitions and do not necessarily detail the full range of materials and processes needed to complete the construction.

1. Section intentionally omitted.

2. The undersigned has reviewed the Work outlined in the Contract Documents and fully understands the scope of Work required in this Bid, understands the construction and project management function(s) is described in the Contract Documents, and that each Bidder who is awarded a contract shall be in fact a prime contractor, not a subcontractor, to County, and agrees that its Bid, if accepted by County, will be the basis for the Bidder to enter into a contract with County in accordance with the intent of the Contract Documents.

3. The undersigned has notified County in writing of any discrepancies or omissions or of any doubt, questions, or ambiguities about the meaning of any of the Contract Documents, and has contacted the Construction Manager before bid date to verify the issuance of any clarifying Addenda.

4. The undersigned agrees to commence work under this Contract on the date established in the Contract Documents and to complete all work within the time specified in the Contract Documents.

5. The liquidated damages clause of the General Conditions and Agreement is hereby acknowledged.
6. It is understood that County reserves the right to reject this bid and that the bid shall remain open to acceptance and is irrevocable for a period of ninety (90) days.

7. The following documents are attached hereto:

    a. Bid Bond on Bid Security Form Document 00 43 13 or other security
    b. Designated Subcontractors List Document 00 43 36
    c. Site-Visit Certification Document 00 45 01, if a site visit was required
    d. Non-Collusion Affidavit Document 00 45 13
    e. Construction Outreach Program Certifications as required by Supplementary Instructions to Bidders - Construction Outreach Program Document 00 22 19
    f. Completed Debarment Form, Document 00 52 13.1

Receipt and acceptance of the following addenda is hereby acknowledged:

No.___, Dated _____	No.___, Dated _____
No.___, Dated _____	No.___, Dated _____
No.___, Dated _____	No.___, Dated _____
No.___, Dated _____	No.___, Dated _____

8. Bidder acknowledges that the license required for performance of the Work is a **B General Contracting** license.

9. The undersigned hereby certifies that Bidder is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the Work.

10. The Bidder represents that it is competent, knowledgeable and has special skills with respect to the nature, extent, and inherent conditions of the Work to be performed. Bidder further acknowledges that there are certain peculiar and inherent conditions existent in the construction of the Work that may create, during the Work, unusual or peculiar unsafe conditions hazardous to persons and property.

11. Bidder expressly acknowledges that it is aware of such peculiar risks and that it has the skill and experience to foresee and to adopt protective measures to adequately and safely perform the Work with respect to such hazards.

12. Bidder expressly acknowledges that it is aware that if a false claim is knowingly submitted (as the terms "claim" and "knowingly" are defined in the California False Claims Act, Cal. Gov. Code, §12650 et seq.), County will be entitled to civil remedies set forth in the California False Claim Act. It may also be considered fraud and the Contractor may be subject to criminal prosecution.

13. The undersigned Bidder certifies that it is, at the time of bidding, and shall be throughout the period of the contract, licensed by the State of California to do the type of work required under the terms of the Contract Documents. Bidder further certifies that it is regularly engaged in the general class and type of work called for in the Contract Documents.

14. The undersigned Bidder certifies that it is not, at the time of bidding, on the California Department of General Services (DGS) list of persons determined to be engaged in investment activities in Iran or otherwise in violation of the Iran Contracting Act of 2010 (Public Contract Code Section 2200-2208).

Furthermore, Bidder hereby certifies to County that all representations, certifications, and statements made by Bidder, as set forth in this bid form, are true and correct and are made under penalty of perjury pursuant to the laws of California.

Dated this _____ day of _____ 20 ___

Name of Bidder _____

Type of Organization _____

Signed by _____

Title of Signer _____

Address of Bidder _____

Taxpayer's Identification No. of Bidder _____

Telephone Number _____

Fax Number _____

E-mail _____ Web page _____

Contractor's License No(s): No.: _____ Class: _____ Expiration Date: _____

No.: _____ Class: _____ Expiration Date: _____

No.: _____ Class: _____ Expiration Date: _____

Department of Industrial Relations Registration Number: _____

If Bidder is a corporation, affix corporate seal.

Name of Corporation: _____

President: _____

Secretary: _____

Treasurer: _____

Manager: _____

END OF DOCUMENT

DOCUMENT 00 43 13

BID SECURITY FORM

(Bid Bond)

(Note: If Bidder is providing a bid bond as its bid security, Bidder must use this form, NOT a surety company form.)

KNOW ALL PERSONS BY THESE PRESENTS:

That the undersigned, as _____ as Principal ("Principal"),

and _____ as Surety ("Surety"),

a corporation organized and existing under and by virtue of the laws of the State of _____ and authorized to do business as a surety in the State of California, are held and firmly bound unto the County of Alameda, State of California as Obligee, in the sum of

_____ ($ _____)

lawful money of the United States of America, for the payment of which sum well and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal has submitted a bid to County for all Work specifically described in the accompanying bid;

Now, therefore, if the Principal is awarded the Contract and, within the time and manner required under the Contract Documents, after the prescribed forms are presented to Principal for signature, enters into a written contract, in the prescribed form in accordance with the bid, and files two bonds, one guaranteeing faithful performance and the other guaranteeing payment for labor and materials as required by law, and meets all other conditions to the contract between the Principal and the Obligee becoming effective, or if the Principal shall fully reimburse and save harmless the Obligee from any damage sustained by the Obligee through failure of the Principal to enter into the written contract and to file the required performance and labor and material bonds, and to meet all other conditions to the Contract between the Principal and the Obligee becoming effective, then this obligation shall be null and void; otherwise, it shall be and remain in full force and effect. The full payment of the sum stated above shall be due immediately if Principal fails to execute the Contract within seven (7) days of the date of the County's Notice of Award to Principal.

Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or the call for bids, or to the work to be performed thereunder, or the specifications accompanying the same, shall in any way affect its

obligation under this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or the call for bids, or to the work, or to the specifications.

In the event suit is brought upon this bond by the Obligee and judgment is recovered, the Surety shall pay all costs incurred by the Obligee in such suit, including a reasonable attorneys' fee to be fixed by the Court.

If the County awards the bid, the security of unsuccessful bidder(s) shall be returned within sixty (60) days from the time the award is made. Unless otherwise required by law, no bidder may withdraw its bid for ninety (90) days after the date of the bid opening.

IN WITNESS WHEREOF, this instrument has been duty executed by the Principal and Surety above named, on the _____ day of _____, 20___.

(Affix Corporate Seal)

_____
Principal

_____
By

(Affix Corporate Seal)

_____
Surety

_____
By

_____
Name of California Agent of Surety

_____
Address of California Agent of Surety

_____
Telephone Number of California Agent of Surety

Bidder must attach Power of Attorney and Certificate of Authority for Surety and a Notarial Acknowledgment for all Surety's signatures. The California Department of Insurance must authorize the Surety to be an admitted Surety Insurer.

END OF DOCUMENT

DOCUMENT 00 43 36

DESIGNATED SUBCONTRACTORS LIST

PROJECT: **ITD Headquarters 393-13th Street Renovations**

Bidder must list hereinafter the name and location of each subcontractor who will be employed, and the kind of Work that each will perform if the Contract is awarded to the Bidder. Bidder acknowledges and agrees that under Public Contract Code section 4100, et seq., it must clearly set forth below the name and location of each subcontractor who will perform work or labor or render service to the Bidder in or about the construction of the Work in an amount in excess of one-half of one percent (1/2 of 1%) of Bidder's total Bid, and that as to any Work that Bidder fails to list, Bidder agrees to perform that portion itself or be subjected to penalty under applicable law.

In case more than one subcontractor is named for the same kind of Work, state the portion that each will perform. Vendors or suppliers of materials only do not need to be listed.

If further space is required for the list of proposed subcontractors, additional sheets showing the required information, as indicated below, shall be attached hereto and made a part of this document.

Name and City of Subcontractor **(1) (4)**	Description of Work: Reference to Contract Items **(1)**	Prices Under Subcontract **(2) (3)**	Subcontractor's License Numbers.		
			State of California Contractor's License **(2)**	Dept. of Industrial Relations Registration No. (DIR) **(2)**	Business License and City/County Issued **(2)**

(Bidder to attach additional sheet(s) if necessary)

(1) Submit this information with sealed bid.
(2) This information shall be required of the two (2) apparent low bidders, no later than two days following the bid opening. **DO NOT SUBMIT WITH BID**.
(3) Dollar amounts will be treated as proprietary and will solely be for the use of County staff. **DO NOT SUBMIT WITH BID**.
(4) Submit full address of Subcontractors two days following bid opening.

END OF DOCUMENT

DOCUMENT 00 45 01

SITE-VISIT CERTIFICATION

For Projects Where A Site Visit Was Mandatory

PROJECT: **ITD Headquarters 393-13th Street Renovations**

Check whichever option applies:

____ I certify that I visited the Site of the proposed Work and became fully acquainted with the conditions relating to construction and labor. I fully understand the facilities, difficulties, and restrictions attending the execution of the Work under contract.

____ I certify that _____ (Bidder's representative) visited the Site of the proposed Work and became fully acquainted with the conditions relating to construction and labor. The Bidder's representative fully understood the facilities, difficulties, and restrictions attending the execution of the Work under contract.

Bidder fully indemnifies the County of Alameda, its Architect, its Engineer, its Construction Manager, and all of their respective officers, agents, employees, and consultants from any damage, or omissions, related to conditions that could have been identified during my visit and/or the Bidder's representative's visit to the Site.

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: _____

Proper Name of Bidder: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

DOCUMENT 00 45 13

NON-COLLUSION AFFIDAVIT
Public Contract Code Section 7106

TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID

STATE OF CALIFORNIA)
) ss.
COUNTY OF _____)

_____ being first duly sworn deposes and says that he or she is _____ of _____, the Bidder making the foregoing Bid that the Bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the Bid is genuine and not collusive or sham; that the Bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the Bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the Bid price of the Bidder or any other bidder, or to fix any overhead, profit, or cost element of the Bid price, or of that of any other bidder, or to secure any advantage against the County of anyone interested in the proposed Contract; that all statements contained in the bid are true; and, further, that the Bidder has not, directly or indirectly, submitted his or her Bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

I certify and declare under penalty of perjury under the laws of the State of California that all the foregoing information in this Non-Collusion Affidavit is true and correct.

Date: _____

Proper Name of Bidder: _____

Signature: _____

Print Name: _____

Title: _____

(ATTACH NOTARIAL ACKNOWLEDGMENT FOR THE ABOVE SIGNATURE)

END OF DOCUMENT

DOCUMENT 00 45 26

WORKERS' COMPENSATION CERTIFICATION

PROJECT NO. **16007** between County of Alameda (the "County" or the "Owner") and _____ (the "Contractor" or the "Bidder") (the "Contract" or the "Project").

Labor Code section 3700 in relevant part provides:

> Every employer except the State shall secure the payment of compensation in one or more of the following ways:
>
> a. By being insured against liability to pay compensation by one or more insurers duly authorized to write compensation insurance in this state.
>
> b. By securing from the Director of Industrial Relations a certificate of consent to self-insure, which may be given upon furnishing proof satisfactory to the Director of Industrial Relations of ability to self-insure and to pay any compensation that may become due to his employees.

I am aware of the provisions of section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the Work of this Contract.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

(In accordance with Article 5 - commencing at section 1860, chapter 1, part 7, division 2 of the Labor Code, the above certificate must be signed and filed with the awarding body prior to performing any Work under this Contract.)

END OF DOCUMENT

DOCUMENT 00 45 46.01

PREVAILING WAGE AND RELATED LABOR REQUIREMENTS CERTIFICATION

PROJECT/CONTRACT NO. 16007 between County of Alameda (the "County" or the "Owner") and _____ (the "Contractor" or the "Bidder") (the "Contract" or the "Project").

I hereby certify that I will conform to the State of California Public Works Contract requirements regarding prevailing wages, benefits, on-site audits **with 48-hours notice**, payroll records, and apprentice and trainee employment requirements, for all Work on the above Project.

I hereby acknowledge that County will use the Alameda County Contract Compliance System, including the Elation Systems, Inc. program, to monitor contract labor compliance and Local Hiring Program compliance monitoring. Contractor shall use these Compliance Systems to meet County's requirements, and shall participate in training as directed by County in order to become and remain competent in the use of the Compliance System**s**. Costs associated with the Alameda County Contract Compliance System, including the Elation Systems, Inc. program**s** shall be borne by Contractor and shall not increase the cost of the Contract.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

DOCUMENT 00 45 46.04

HAZARDOUS MATERIALS CERTIFICATION

PROJECT NO. **16007** ("Contract" or "Project") between the County of Alameda ("County") and

_____ ("Contractor")

1. Contractor hereby certifies that no Asbestos, or Asbestos-Containing Materials, polychlorinated biphenyl (PCB), or any material listed by the federal or state Environmental Protection Agency or federal or state health agencies as a hazardous material, or any other material defined as being hazardous under federal or state laws, rules, or regulations ("New Hazardous Material"), shall be furnished, installed, or incorporated in any way into the Project or in any tools, devices, clothing, or equipment used to affect any portion of Contractor's work on the Project for County.

2. Contractor further certifies that it has instructed its employees with respect to the above-mentioned standards, hazards, risks, and liabilities.

3. Asbestos and/or asbestos-containing material shall be defined as all items containing detectable amounts of, but not limited to, chrysotile, crocidolite, amosite, anthophyllite, tremolite, and actinolite.

4. Any disputes involving the question of whether or not material is New Hazardous Material shall be settled by electron microscopy or other appropriate and recognized testing procedure, at the County's determination. The costs of any such tests shall be paid by Contractor if the material is found to be New Hazardous Material.

5. All Work or materials found to be New Hazardous Material or Work or material installed with equipment containing "New Hazardous Material" will be immediately rejected and this Work will be removed at Contractor's expense at no additional cost to the County.

6. Contractor has read and understood the document Hazardous Materials Procedures & Requirements, and shall comply with all the provisions outlined therein.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

DOCUMENT 00 45 46.06

IMPORTED MATERIALS CERTIFICATION

PROJECT NO. **16007** between County of Alameda ("County" or "Owner") and

_____ ("Contractor") ("Contract" or "Project").

This form shall be executed by the Contractor and by all entities that, in any way, provide or deliver and/or supply any soils, aggregate, or related materials ("Fill") to the Project Site. All Fill shall satisfy all requirements of any environmental review of the Project performed pursuant to the statutes and guidelines of the California Environmental Quality Act, and section 21000 et seq. of the Public Resources Code ("CEQA").

To the furthest extent permitted by California law, Contractor shall defend, indemnify, and hold harmless the County, its agents, representatives, officers, consultants, employees, trustees, and volunteers pursuant to the indemnification provisions in the Contract Documents for, without limitation, any claim(s) connected with providing, delivering, and/or supplying Fill.

Certification of:
☐ Delivery Firm/Transporter ☐ Supplier ☐ Manufacturer
☐ Wholesaler ☐ Broker ☐ Retailer
☐ Distributor ☐ Other _____

Type of Entity
☐ Corporation ☐ General Partnership
☐ Limited Partnership ☐ Limited Liability Company
☐ Sole Proprietorship ☐ Other _____

Name of firm ("Firm"): _____

Mailing address: _____

Addresses of branch office used for this Project: _____

If subsidiary, name and address of parent company: _____

_____

_____

By my signature below, I hereby certify that I am aware of section 25260 of the Health and Safety Code and the sections referenced therein regarding the definition of hazardous material. I further certify on behalf of the Firm that all soils, aggregates, or related materials provided, delivered, and/or supplied or that will be provided, delivered, and/or supplied by this Firm to the

Project Site are free of any and all hazardous material as defined in section 25260 of the Health and Safety Code. I further certify that I am authorized to make this certification on behalf of the Firm.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

DOCUMENT 00 51 00

NOTICE OF AWARD

Dated: _____ 20___

To: _____
(Contractor)
To: _____
(Address)

From: The County of Alameda

PROJECT: **ITD Headquarters 393-13th Street Renovations**

("Project" or "Contract").

Contractor has been awarded the referenced Contract on _____, **2017**, by action of the County's Board of Supervisors.

The Contract Price is _____ Dollars ($_____), and includes alternates _____.

Three (3) copies of each of the Contract Documents (except Drawings) accompany this Notice of Award. Three (3) sets of the Drawings will be delivered separately or otherwise made available. Additional copies are available at cost of reproduction.

The Bidder to whom Contract is awarded shall execute and submit the following documents by 5:00 p.m. of the **SEVENTH (7TH)** Calendar day following the date of the Notice of Award. Failure to properly and timely submit these documents entitles County to reject the bid as non-responsive.

a. **Agreement**: To be executed by successful Bidder. Submit four (4) copies, each bearing an original signature.

b. **Escrow of Bid Documentation**: This must include all required documentation. See the document Escrow of Bid Documentation for more information.

c. **Performance Bond (100%)**: On the form provided in the Contract Documents and fully executed as indicated on the form.

d. **Payment Bond (100%)** (Contractor's Labor and Material Payment Bond): On the form provided in the Contract Documents and fully executed as indicated on the form.

e. **Insurance Certificates and Endorsements** as required.

f. Workers' Compensation Certification.

g. Prevailing Wage and Related Labor Requirements Certification.

h. **Hazardous Materials Certification**.

i. Imported Materials Certification.

j. Completed, signed Document 00 52 13.1 **Debarment And Suspension Certification Form**

Failure to comply with these conditions within the time specified will entitle County to consider your bid abandoned, to annul this Notice of Award, and to declare your Bid Security forfeited, as well as any other rights the County may have against the Contractor.

After you comply with those conditions, County will return to you one fully signed counterpart of the Agreement.

The County of Alameda

BY: _____

NAME: _____

TITLE: _____

END OF DOCUMENT

DOCUMENT 00 51 13

NOTICE OF INTENT TO AWARD

[DATE]

[NAME]
[COMPANY]
[ADDRESS]
[CITY, STATE, ZIP]

SUBJECT: **INTENT TO AWARD A CONTRACT FOR PROJECT NO. 16007**

Thank you for your participation and interest in the County of Alameda. Based on its evaluation and acceptance of the bids submitted, GSA will be recommending to its Board of Supervisors that the contract for project number **16007** be awarded to [CONTRACTOR].

GSA's recommendation to accept and award a contract should go before the Board on Tuesday, [DATE]. Upon Board approval a draft contract will be submitted to the awardee for review.

Below is a summary of all bids/proposals received for this project.

Bidder	Location	Bid Price*

(*) – A 5% bid preference (stipulated in the ECOP) was given to _____; therefore, their bid is evaluated at $_____ which makes them the lowest responsive bidder.

Any bid protest by any Bidder regarding any other bid must be submitted in writing **by the fifth (5th) calendar day following the date of this notice.** Please refer to Document 00 21 13 - Instructions To Bidders for submittal requirements. The bid protest procedure and time limits set forth in Document 00 21 13 are mandatory and are your sole and exclusive remedy in the event of a bid protest.

For information on other contracting opportunities please visit our websites at http://www.acgov.org/gsa/purchasing/bid_content/FutureContractOpportunities.jsp for Upcoming Contracting Opportunities and http://www.acgov.org/gsa/purchasing/bid_content/ContractOpportunities.jsp for Current Contracting Opportunities.

The County of Alameda

BY: _____

NAME: _____

TITLE: _____

END OF DOCUMENT

DOCUMENT 00 52 13

AGREEMENT FORM – STIPULATED SUM (SINGLE-PRIME CONTRACT)

THIS AGREEMENT IS MADE AND ENTERED INTO THIS _____ DAY OF _____ _____, 20___, by and between the County of Alameda (County") and _____ _____ ("Contractor") ("Agreement").

WITNESSETH: That the parties hereto have mutually covenanted and agreed, and by these presents do covenant and agree with each other, as follows:

1. **The Work:** Contractor agrees to furnish all tools, equipment, apparatus, facilities, labor, and material necessary to perform and complete in a good and workmanlike manner, the work of

PROJECT: **ITD Headquarters 393-13th Street Renovations**
("Project" or "Contract" or "Work")

for which the Drawings and Specifications are identified by the signature of the parties to this Agreement. It is understood and agreed that the Work shall be performed and completed as required in the Contract Documents including, without limitation, the Drawings and Specifications, under the direction and supervision of, and subject to, the approval of County or its authorized representative.

2. **The Contract Documents**: The complete Contract consists of all Contract Documents as defined in the General Conditions and incorporated herein by this reference. Any and all obligations of the County and Contractor are fully set forth and described in the Contract Documents. All Contract Documents are intended to cooperate so that any Work called for in one and not mentioned in the other or vice versa is to be executed the same as if mentioned in all Contract Documents.

3. **Interpretation of Contract Documents**: Should any question arise concerning the intent or meaning of Contract Documents, including the Drawings or Specifications, the question shall be submitted to the County for interpretation. If a conflict exists in the Contract Documents, modifications, beginning with the most recent, shall control over this Agreement, which shall control over the Special Conditions, which shall control over the General Conditions, which shall control over the remaining Division 00 documents, which shall control over Division 01 Documents, which shall control over Division 02 through Division 49 documents, which shall control over figured dimensions, which shall control over large-scale drawings, which shall control over small-scale drawings. In no case shall a document calling for lower quality and/or quantity material or workmanship control. The decision of County in the matter shall be final.

4. **Time for Completion**: It is hereby understood and agreed that the work under this contract shall be completed within **Two Hundred Eighty-Seven (287)** consecutive calendar days ("Contract Time") from the date specified in the County's Notice to Proceed.

5. **Completion-Extension Of Time**: Should the Contractor fail to complete this Contract, and the Work provided herein, within the time fixed for completion, due allowance being made for the contingencies provided for herein, the Contractor shall become liable to the County for all loss and damage that the County may suffer on account thereof. The Contractor shall coordinate its work with the Work of all other contractors. County shall not be liable for delays resulting from Contractor's failure to coordinate its Work with other contractors in a manner that will allow timely completion of Contractor's Work. Contractor shall be liable for delays to other contractors caused by Contractor's failure to coordinate its Work with the work of other contractors.

6. **Liquidated Damages**: Time is of the essence for all work under this Agreement. It is hereby understood and agreed that it is and will be difficult and/or impossible to ascertain and determine the actual damage that County will sustain in the event of and by reason of Contractor's delay; therefore, Contractor agrees that it shall pay to the County the sum of **One Thousand Dollars ($1,000*)*** per day as liquidated damages for each and every day's delay beyond the time herein prescribed in finishing the Work. It is hereby understood and agreed that this amount is not a penalty.

In the event any portion of the liquidated damages is not paid to County, County may deduct that amount from any money due or that may become due the Contractor under this Agreement. County's right to assess liquidated damages is as indicated herein and in the General Conditions.

The time during which the Contract is delayed for cause as hereinafter specified may extend the time of completion for a reasonable time as County may grant. This provision does not exclude the recovery of damages for delay by either party under other provisions in the Contract Documents.

7. **Indemnity: To the fullest extent permitted by law (including, without limitation, California Civil Code Section 2782), Contractor shall defend (with legal counsel reasonably acceptable to the County), indemnify and hold harmless County and its officers, agents, departments, officials, representatives and employees (collectively "Indemnitees") from and against any and all claims, loss, cost, damage, injury (including, without limitation, injury to or death of an employee of Contractor or its Subcontractors), expense and liability of every kind, nature and description (including, without limitation, incidental and consequential damages, court costs, attorneys' fees, litigation expenses and fees of expert consultants or expert witnesses incurred in connection therewith and costs of investigation) which arises out of or is in any way connected to the performance of this agreement (collectively "Liabilities") except where such Liabilities are caused solely by the negligence or**

willful misconduct of any indemnitee. The County may participate in the defense of any such claim without relieving Contractor of any obligation hereunder. This indemnification, defense, and hold harmless obligation includes any failure or alleged failure by Contractor to comply with any provision of law or the Contract Documents, including, without limitation, any stop notice actions, or liens by the California Department of Labor Standards Enforcement. This indemnity obligation shall be for the full amount of all damage to County, including defense costs, and shall not be limited by any insurance limits.

7.1 Contactor shall defend (with legal counsel reasonably acceptable to the County), indemnify and hold harmless the Indemnitees from all loss, cost, damage, expense, liability or claims, in law or in equity, including attorneys' fees, court costs, litigation expenses and fees of expert consultants or expert witnesses, that may at any time arise for any infringement of the patent rights, copyright, trade secret, trade name, trademark, service mark or any other proprietary right of any person or persons in consequence of the use by County, or any of the other Indemnitees, of articles or Services to be supplied in the performance of this Agreement.

7.2 Contractor shall place in its subcontracting agreements and cause its Subcontractors to agree to indemnities and insurance obligations in favor of County and other Indemnitees in the exact form and substance of those contained in this Agreement. Contractor shall require all subcontractors to comply with all indemnification and insurance requirements of this agreement, including, without limitation, Exhibit C. Contactor shall verify subcontractor's compliance.

8. **Loss Or Damage**: County and its authorized representatives shall not in any way or manner be answerable or suffer loss, damage, expense, or liability for any loss or damage that may happen to the Work, or any part thereof, or in or about the same during its construction and before acceptance, and the Contractor shall assume all liabilities of every kind or nature arising from the Work, either by accident, negligence, theft, vandalism, or any cause whatever; and shall hold County and its authorized representatives harmless from all liability of every kind and nature arising from accident, negligence, or any cause whatever.

9. **Insurance and Bonds**: Contractor shall provide all required certificates of insurance, and payment and performance bonds as evidence thereof.

10. **Prosecution of Work**: If the Contractor should neglect to prosecute the Work properly or fail to perform any provisions of this contract, County, may, pursuant to the General Conditions and without prejudice to any other remedy it may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor.

11. **Authority of Architect**: Contractor hereby acknowledges that the Architect has authority to approve and/or stop Work if the Contractor's Work does not comply with the requirements of the Contract Documents and all applicable laws. The Contractor shall be liable for any delay caused by its non-compliant Work.

12. **Assignment of Contract**: Neither the Contract, nor any part thereof, nor any moneys due or to become due thereunder, may be assigned by the Contractor without the written

approval of the County, nor without the written consent of the Surety on the Contractor's Performance Bond (the "Surety"), unless the Surety has waived in writing its right to notice of assignment.

13. **Classification Of Contractor's License**: Contractor hereby acknowledges that it currently holds valid Type **B General Contractor's** license(s) issued by the State of California, Contractor's State Licensing Board, in accordance with division 3, chapter 9, of the Business and Professions Code and in the classification called for in the Contract Documents.

14. It is County policy to minimize the expenditure of County funds on goods and services produced by any entity which buys, sell, leases or distributes commodities and/or professional services to (1) the government of Burma; or (2) any entity organized under the laws of Burma; or (3) any entity which does business with any private or public entity located in Burma, or conducts operations in Burma. Contractors are urged to comply with the policy in making purchases and subcontracts. (ref. Alameda County, Cal., Adm. Code Title.4, §4.32.050(B),(F))

15. **Payment of Prevailing Wages**: The Contractor and all Subcontractors under the Contractor shall pay all workers on all Work performed pursuant to this Contract **not less than the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work** as determined by the Director of the Department of Industrial Relations, State of California, for the type of work performed and the locality in which the work is to be performed within the boundaries of County, pursuant to sections 1770 et seq. of the California Labor Code.

16. **Contract Price**: In consideration of the foregoing covenants, promises, and agreements on the part of the Contractor, and the strict and literal fulfillment of each and every covenant, promise, and agreement, and as compensation agreed upon for the Work and construction, erection, and completion as aforesaid, County covenants, promises, and agrees that it will well and truly pay and cause to be paid to the Contractor in full, and as the full Contract Price and compensation for construction, erection, and completion of the Work hereinabove agreed to be performed by the Contractor, the following price:

_____ _Dollars($_____),

in lawful money of the United States, which sum is to be paid according to the schedule provided by the Contractor and accepted by County and subject to additions and deductions as provided in the Contract. This amount supersedes any previously stated and/or agreed to amount(s).

17. **Severability**: If any term, covenant, condition, or provision in any of the Contract Documents is held by a court of competent jurisdiction to be invalid, void or unenforceable, the remainder of the provisions in the Contract Documents shall remain in full force and effect and shall in no way be affected, impaired, or invalidated thereby.

IN WITNESS WHEREOF, accepted and agreed on the date indicated above:

CONTRACTOR	**COUNTY OF ALAMEDA**
By: _____	By: _____
Title: _____	Title: _____

NOTE: If the party executing this Contract is a corporation, a certified copy of the by-laws, or of the resolution of the Board of Directors, authorizing the officers of said corporation to execute the Contract and the bonds required thereby must be attached hereto.

Approved as to form: _____
(Deputy) County Counsel

I hereby certify under penalty of perjury that the President of the Board of Supervisors was duly authorized to execute this document on behalf of the County of Alameda by a majority vote of the Board on **_____[DATE OF AWARD]**; and that a copy has been delivered to the President as provided by Government Code Section 25103.

_____
Date

_____
Clerk of the Board of Supervisors,
County of Alameda, State of California

END OF DOCUMENT

DOCUMENT 00 52 13.1

COUNTY OF ALAMEDA
DEBARMENT AND SUSPENSION CERTIFICATION FORM

The bidder, under penalty of perjury, certifies that, except as noted below, bidder, its Principal, and any named and unnamed subcontractor:

- Is not currently under suspension, debarment, voluntary exclusion, or determination of ineligibility by any federal agency;
- Has not been suspended, debarred, voluntarily excluded or determined ineligible by any federal agency within the past three years;
- Does not have a proposed debarment pending; and
- Has not been indicted, convicted, or had a civil judgment rendered against it by a court of competent jurisdiction in any matter involving fraud or official misconduct within the past three years.

If there are any exceptions to this certification, insert the exceptions in the following space.

Exceptions will not necessary result in denial of award, but will be considered in determining bidder responsibility. For any exception noted above, indicate below to whom it applies, initiating agency, and dates of action.

Notes: Providing false information may result in criminal prosecution or administrative sanctions. The above certification is part of the Proposal. Signing this Proposal on the signature portion thereof shall also constitute signature of this Certification.

BIDDER: _____

PRINCIPAL: _____ TITLE: _____

SIGNATURE: _____ DATE: _____

DOCUMENT 00 55 00

NOTICE TO PROCEED

Dated: _____, 20___

TO: _____
(Contractor)

ADDRESS: _____

_____

_____

PROJECT: **ITD Headquarters – 393-13th Street Renovation Project**

PROJECT NO. **16007** between County of Alameda and Contractor ("Contract").

You are notified that the Contract Time under the above Contract will commence to run on _____, **2017**. By that date, you are to start performing your obligations under the Contract Documents. In accordance with the Agreement executed by Contractor, the date of completion is _____, **2018.**

You must submit the following documents by 5:00 p.m. of the **TENTH (10TH)** business day following the date of this Notice to Proceed:

a. Contractor's **preliminary schedule of construction**.

b. Contractor's **preliminary schedule of values** for all of the Work.

c. Contractor's **preliminary schedule of submittals**, including Shop Drawings, Product Data, and Samples submittals

d. **Contractor's Safety Plan** specifically adapted for the Project.

e. A **complete subcontractors list**, including the name, address, telephone number, facsimile number, California State Contractors License number, classification, and monetary value of all Subcontracts.

Thank you. We look forward to a very successful Project.

COUNTY OF ALAMEDA

BY: _____

NAME: Maritza Delgadillo

TITLE: Senior Project Manager

END OF DOCUMENT

DOCUMENT 00 56 00

ESCROW OF BID DOCUMENTATION

1. Requirement to Escrow Bid Documentation

a. Contractor shall submit, within **SEVEN (7)** calendar days after the date of the Notice of Award, one copy of all documentary information received or generated by Contractor in preparation of bid prices for this Contract, as specified herein. This material is referred to herein as "Escrow Bid Documentation." The Escrow Bid Documentation of the Contractor will be held in escrow for the duration of the Contract.

b. Contractor agrees, as a condition of award of the Contract, that the Escrow Bid Documentation constitutes all written information used in the preparation of its bid, and that no other written bid preparation information shall be considered in resolving disputes or claims. Contractor also agrees that nothing in the Escrow Bid Documentation shall change or modify the terms or conditions of the Contract Documents.

c. The Escrow Bid Documentation will not be opened by County except as indicated herein. The Escrow Bid Documentation will be used only for the resolution of change orders and claims disputes.

d. Contractor's submission of the Escrow Bid Documentation, as with the bonds and insurance documents required, is considered an essential part of the Contract award. Should the Contractor fail to make the submission within the allowed time specified above, County may deem the Contractor to have failed to enter into the Contract, and the Contractor shall forfeit the amount of its bid security, accompanying the Contractor's bid, and County may award the Contract to the next lowest responsive responsible bidder.

e. NO PAYMENTS WILL BE MADE, NOR WILL COUNTY ACCEPT PROPOSED CHANGE ORDERS UNTIL THE ABOVE REQUIRED INFORMATION IS SUBMITTED AND APPROVED.

f. The Escrow Bid Documentation shall be submitted in person by an authorized representative of the Contractor to County.

2. Ownership of Escrow Bid Documentation

a. The Escrow Bid Documentation is, and shall always remain, the property of Contractor, subject to review by County, as provided herein.

b. Escrow Bid Documentation constitute trade secrets, not known outside Contractor's business, known only to a limited extent and only by a limited number of employees of Contractor, safeguarded while in Contractor's possession, extremely valuable to Contractor, and could be extremely valuable to Contractor's competitors by virtue of it reflecting Contractor's contemplated techniques of construction. Subject to the provisions herein, County agrees to safeguard the Escrow Bid Documentation, and all information contained therein, against disclosure to the fullest extent permitted by law.

3. Format and Contents of Escrow Bid Documentation

a. Contractor may submit Escrow Bid Documentation in its usual cost-estimating format; a standard format is not required. The Escrow Bid Documentation shall be submitted in the English language.

b. Escrow Bid Documentation must clearly itemize the estimated costs of performing the work of each bid item contained in the bid schedule, separating bid items into sub-items as required to present a detailed cost estimate and allow a detailed cost review. The Escrow Bid Documentation shall include all subcontractor bids or quotes, supplier bids or quotes, quantity takeoffs, crews, equipment, calculations of rates of production and progress, copies of quotes from subcontractors and suppliers, and memoranda, narratives, add/deduct sheets, and all other information used by the Contractor to arrive at the prices contained in the bid proposal. Estimated costs should be broken down into Contractor's usual estimate categories such as direct labor, repair labor, equipment ownership and operation, expendable materials, permanent materials, and subcontract costs as appropriate. Plant and equipment and indirect costs should be detailed in the Contractor's usual format. The Contractor's allocation of indirect costs, contingencies, markup, and other items to each bid item shall be identified.

c. All costs shall be identified. For bid items amounting to **less than $10,000, estimated unit costs** are acceptable without a detailed cost estimate, provided that labor, equipment, materials, and subcontracts, as applicable, are included and provided that indirect costs, contingencies, and markup, as applicable, are allocated.

d. Bid Documentation provided by County should not be included in the Escrow Bid Documentation unless needed to comply with the following requirements.

4. Submittal of Escrow Bid Documentation

a. The Escrow Bid Documentation shall be submitted by the Contractor in a sealed container within **SEVEN (7)** calendar days after the date of the Notice of Award. The container shall be clearly marked on the outside with the Contractor's name, date of submittal, project name and the words "Escrow Bid Documentation –

Intended to be opened in the presence of Authorized Representatives of Both County and Contractor".

b. By submitting Escrow Bid Documentation, Contractor represents that the material in the Escrow Bid Documentation constitutes all the documentary information used in preparation of the bid and that the Contractor has personally examined the contents of the Escrow Bid Documentation container and has found that the documents in the container are complete.

c. If Contractor's proposal is based upon subcontracting any part of the work, each subcontractor whose total subcontract price **exceeds 5 percent of the total contract price** proposed by Contractor, shall provide separate Escrow Documents to be included with those of Contractor. Those documents shall be opened and examined in the same manner and at the same time as the examination described above for Contractor.

d. If Contractor wishes to subcontract any portion of the Work after award, County retains the right to require Contractor to submit Escrow Documents for the Subcontractor before the subcontract is approved.

5. Storage, Examination and Final Disposition of Escrow Bid Documentation

a. The Escrow Bid Documentation will be placed in escrow, for the life of the Contract, in a mutually agreeable institution. The cost of storage will be paid by Contractor for the duration of the project until final Contract payment. The storage facilities shall be the appropriate size for all the Escrow Bid Documentation and located conveniently to both County's and Contractor's offices.

b. The Escrow Bid Documentation shall be examined by both County and Contractor, at any time deemed necessary by either County or Contractor, to assist in the negotiation of price adjustments and change orders or the settlement of disputes and claims. In the case of legal proceedings, Escrow Bid Documentation shall be used subject to the terms of an appropriate protective order if requested by Contractor and ordered by a court of competent jurisdiction. Examination of the Escrow Bid Documentation is subject to the following conditions:

(1) As trade secrets, the Escrow Bid Documentation is proprietary and confidential to the extent allowed by law.

(2) County and Contractor shall each designate, in writing to the other party **SEVEN (7)** calendar days prior to any examination, the names of representatives who are authorized to examine the Escrow Bid Documentation. No other person shall have access to the Escrow Bid Documentation.

(3) Access to the documents may take place only in the presence of duly designated representatives of the County and Contractor. If Contractor fails to designate a representative or appear for joint examination on **SEVEN (7)** calendar days notice, then the County representative may examine the Escrow Bid Documents alone upon an additional **THREE (3)** calendar days notice if a representative of the Contractor does not appear at the time set.

(4) If a subcontractor has submitted sealed information to be included in the Escrow Bid Documents, access to those documents may take place only in the presence of a duly designated representative of the County, Contractor and that subcontractor. If that subcontractor fails to designate a representative or appear for joint examination on **SEVEN (7)** calendar days notice, then the County representative and/or the Contractor may examine the Escrow Bid Documentation without that subcontractor present upon an additional **THREE (3)** calendar days notice if a representative of that subcontractor does not appear at the time set.

c. The Escrow Bid Documentation will be returned to Contractor at such time as the Contract has been completed and final settlement has been achieved.

END OF DOCUMENT

DOCUMENT 00 57 00

ESCROW AGREEMENT FOR SECURITY DEPOSITS IN LIEU OF RETENTION

Public Contact Code Section 22300

This Escrow Agreement ("Escrow Agreement") is made and entered into this ____ day of _____, 20___, by and between County of Alameda, whose address is 1401 Lakeside Drive, Suite 800, Oakland, California ("County"); and

_____, whose place of business is located at _____, ("Contractor"); and

_____, a state or federally chartered bank in the state of California, whose place of business is located at _____ _____, ("Escrow Agent").

For the consideration hereinafter set forth, County, Contractor, and Escrow Agent agree as follows:

1. Pursuant to section 22300 of Public Contract Code of the State of California, which is hereby incorporated by reference, Contractor has the option to deposit securities with Escrow Agent as a substitute for retention earnings required to be withheld by County pursuant to the Construction Contract No. _____ entered into between County and Contractor for the **ITD Headquarters 393-13th Street Renovations** in the amount of _____ dated, **2017**, (the "Contract"). Alternatively, on written request of Contractor, County shall make payments of the retention earnings directly to Escrow Agent. When Contractor deposits the securities as a substitute for Contract earnings, Escrow Agent shall **notify County within ten (10) calendar days of the deposit**. The market value of the securities at the time of substitution and at all times from substitution until the termination of the Escrow Agreement shall be at least equal to the cash amount then required to be withheld as retention under terms of Contract between County and Contractor.

   Securities shall be **held in name of County of Alameda**, and shall designate Contractor as beneficial owner.

2. County shall make progress payments to Contractor for those funds which otherwise would be withheld from progress payments pursuant to Contract provisions, provided that Escrow Agent holds securities in form and amount specified above.

3. When County makes payment of retention earned directly to Escrow Agent, Escrow Agent shall hold them for the benefit of Contractor until the time that the escrow created under this Escrow Agreement is terminated. Contractor may direct the investment of the payments into securities. All terms and conditions of this Escrow Agreement and the

rights and responsibilities of the Parties shall be equally applicable and binding when County pays Escrow Agent directly.

4. Contractor shall be responsible for paying all fees for the expenses incurred by Escrow Agent in administering the Escrow Account, and all expenses of County. These expenses and payment terms shall be determined by County, Contractor, and Escrow Agent.

5. Interest earned on securities or money market accounts held in escrow and all interest earned on that interest shall be for sole account of Contractor and shall be subject to withdrawal by Contractor at any time and from time to time without notice to County.

6. Contractor shall have the right to withdraw all or any part of the principal in the Escrow Account only by written notice to Escrow Agent accompanied **by written authorization from County** to Escrow Agent that County consents to withdrawal of amount sought to be withdrawn by Contractor.

7. County shall have the right to draw upon the securities and/or withdraw amounts from the Escrow Account in event of default by Contractor. **Upon seven (7) days written notice to Escrow Agent from County** of the default, if applicable, Escrow Agent shall immediately convert the securities to cash and shall distribute the cash as instructed by County.

8. **Upon receipt of written notification from County** certifying that the Contract is final and complete, and that Contractor has complied with all requirements and procedures applicable to the Contract, Escrow Agent shall release to Contractor all securities and interest on deposit less escrow fees and charges of the Escrow Account. The escrow shall be closed immediately upon disbursement of all monies and securities on deposit and payments of fees and charges.

9. Escrow Agent shall rely on written notifications from County and Contractor pursuant to Paragraphs 5 through 8, inclusive, of this Escrow Agreement and County and Contractor shall hold Escrow Agent harmless from Escrow Agent's release and disbursement of securities and interest as set forth above.

10. Names of persons who are authorized to give written notice or to receive written notice on behalf of County and on behalf of Contractor in connection with the foregoing, and exemplars of their respective signatures are as follows:

On behalf of County:

Senior Project Manager
Title

Maritza Delgadillo
Name

Signature

1401 Lakeside Drive, #800, Oakland, CA
Address

On behalf of Contractor:

Title

Name

Signature

Address

On behalf of Escrow Agent:

Title

Name

Signature

Address

At the time of Escrow Account is opened, County and Contractor shall deliver to Escrow Agent a fully executed of this Agreement.

IN WITNESS WHEREOF, the parties have executed this Agreement by their proper officers on the date first set forth above.

On behalf of County:

Title

Name

Signature

Address

On behalf of Contractor:

Title

Name

Signature

Address

On behalf of Escrow Agent:

Title

Name

Signature

Address

END OF DOCUMENT

DOCUMENT 00 61 13.13

PERFORMANCE BOND FORM
(100% of Contract Price)

(Note: Bidders must use this form, NOT a surety company form.)

KNOW ALL PERSONS BY THESE PRESENTS:

That WHEREAS, the Board of Supervisors of the County of Alameda ("County") and _____, ("Principal)" have entered into a contract for the furnishing of all materials and labor, services and transportation, necessary, convenient, and proper to perform the following project:

ITD Headquarters – 393-13th Street Renovation Project
("Project" or "Contract")

which Contract dated _____, **2017**, and all of the Contract Documents attached to or forming a part of the Contract, are hereby referred to and made a part hereof, and

And WHEREAS, said Principal is required under the terms of the Contract to furnish a bond for the faithful performance of the Contract;

NOW, THEREFORE, the Principal and _____ ("Surety") are held and firmly bound unto the Board of County in the penal sum of _____ DOLLARS ($_____), lawful money of the United States, for the payment of which sum well and truly to be made we bind ourselves, our heirs, executors, administrators, successors, and assigns jointly and severally, firmly by these presents, to perform all the work required to complete the Project and to pay to County all damages County incurs as a result of the Principal's failure to perform all the Work required to complete the Project.

The condition of the obligation is such that, if the above bounden Principal, his or its heirs, executors, administrators, successors, or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions, and agreements in the Contract and any alteration thereof made as therein provided, on his or their part to be kept and performed at the time and in the intent and meaning, and shall indemnify and save harmless County, its trustees, officers and agents, as therein stipulated, then this obligation shall become null and void, otherwise it shall be and remain in full force and virtue.

And the Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its

obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of the Contract or to the work or to the specifications.

IN WITNESS WHEREOF, two (2) identical counterparts of this instrument, each of which shall for all purposes be deemed an original thereof, have been duly executed by the Principal and Surety above named, on the ___ day of _____, 20___.

(Affix Corporate Seal)

_____
Principal

_____
By

_____
Surety

_____
By

_____
Name of California Agent of Surety

_____
Address of California Agent of Surety

_____
Telephone Number of California Agent of Surety

Bidder must attach a Notarial Acknowledgment for all Surety's signatures and a Power of Attorney and Certificate of Authority for Surety. The California Department of Insurance must authorize the Surety to be an admitted surety insurer.

END OF DOCUMENT

DOCUMENT 00 61 13.16

PAYMENT BOND FORM
Contractor's Labor & Material Payment Bond
(100% of Contract Price)

(Note: Bidders must use this form, NOT a surety company form.)

KNOW ALL PERSONS BY THESE PRESENTS:

That WHEREAS, the Board of Supervisors of the County of Alameda ("County") and _____, ("Principal") have entered into a contract for the furnishing of all materials and labor, services and transportation, necessary, convenient, and proper to

ITD Headquarters 393-13th Street Renovation Project
("Project")

which Contract dated _____, **2017**, and all of the Contract Documents attached to or forming a part of the Contract, are hereby referred to and made a part hereof, and

WHEREAS, pursuant to law and the Contract, the Principal is required, before entering upon the performance of the work, to file a good and sufficient bond with the body by which the Contract is awarded in an amount equal to 100 percent (100%) of the Maximum Contract Value, to secure the claims to which reference is made in sections 9000, 9100, 9356 through 9560, and 9564 of the Civil Code of California, and division 2, part 7, of the Labor Code of California.

NOW, THEREFORE, WE, the Principal and_____, ("Surety") are held and firmly bound unto all laborers, material men, and other persons referred to in said statutes in the sum of _____ Dollars ($_____), lawful money of the United States, being a sum not less than the total amount payable by the terms of Contract, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, or assigns, jointly and severally, by these presents.

The condition of this obligation is that if the Principal or any of his or its subcontractors, of the heirs, executors, administrators, successors, or assigns of any, all, or either of them shall fail to pay for any labor, materials, provisions, provender, or other supplies, used in, upon, for or about the performance of the work contracted to be done, or for any work or labor thereon of any kind, or for amounts due under the Unemployment Insurance Act with respect to such work or labor, that the Surety will pay the same in an amount not exceeding the amount herein above set forth, and also in case suit is brought upon this bond, will pay a reasonable attorney's fee to be awarded and fixed by the Court, and to be taxed as costs and to be included in the judgment therein rendered.

It is hereby expressly stipulated and agreed that this bond shall inure to the benefit of any and all persons, companies, and corporations entitled to file claims under sections 9000, 9100, 9356 through 9560, and 9564 of the Civil Code, so as to give a right of action to them or their assigns in any suit brought upon this bond.

Should the condition of this bond be fully performed, then this obligation shall become null and void; otherwise it shall be and remain in full force and affect.

And the Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of Contract or the specifications accompanying the same shall in any manner affect its obligations on this bond, and it does hereby waive notice of any such change, extension, alteration, or addition.

IN WITNESS WHEREOF, **two (2) identical counterparts of this instrument**, each of which shall for all purposes be deemed an original thereof, have been duly executed by the Principal and Surety above named, on the _____ day of _____, 20___.

(Affix Corporate Seal)

_____
Principal

_____
By

_____
Surety

_____
By

_____
Name of California Agent of Surety

_____
Address of California Agent of Surety

_____
Telephone Number of California Agent of Surety

Bidder must attach a Notarial Acknowledgment for all Surety's signatures and a Power of Attorney and Certificate of Authority for Surety. The California Department of Insurance must authorize the Surety to be an admitted surety insurer.

END OF DOCUMENT

DOCUMENT 00 65 19.26

FINAL SETTLEMENT CERTIFICATE FORM

THIS FINAL SETTLEMENT AGREEMENT AND RELEASE OF CLAIMS ("Agreement and Release") IS MADE AND ENTERED INTO THIS _____ DAY OF _____, 2018, by and between the County of Alameda ("County") and ___ _____ ("Contractor"), whose place of business is _____.

RECITALS:

1. County and Contractor entered into PROJECT NO. **16007** ("Contract" or "Project") in the County of Alameda, California.

2. The Work under the Contract has been completed.

NOW, THEREFORE, it is mutually agreed between County and Contractor as follows:

AGREEMENT

3. Contractor will only be assessed liquidated damages as detailed below:

Original Contract Sum	$_____
Modified Contract Sum	$_____
Payment to Date	$_____
Liquidated Damages	$_____
Payment Due Contractor	$_____

4. Subject to the provisions hereof, County shall forthwith pay to Contractor the undisputed sum of $_____ (_____ Dollars and __ _____ Cents) under the Contract, less any amounts represented by any notice to withhold funds on file with County as of the date of such payment.

5. Contractor acknowledges and hereby agrees that there are no unresolved or outstanding claims in dispute against County arising from the performance of work under the Contract, except for the claims described in Paragraph 6 and continuing obligations described in Paragraph 8. It is the intention of the parties in executing this Agreement and Release that this Agreement and Release shall be effective as a full, final and general release of all claims, demands, actions, causes of action, obligations, costs, expenses, damages, losses and liabilities of

Contractor against County, all its respective agents, employees, inspectors, assignees and transferees except for the Disputed Claim is set forth in Paragraph 6 and continuing obligations described in Paragraph 8 hereof.

6. The following claims are disputed (hereinafter, the "Disputed Claims") and are specifically excluded from the operation of this Agreement and Release:

Claim No.	Description of Claim	Amount of Claim	Date Claim Submitted

[Insert information, including attachment if necessary]

7. Consistent with California Public Contract Code section 7100, Contractor hereby agrees that, in consideration of the payment set forth in Paragraph 4 hereof, Contractor hereby releases and forever discharges County, all its agents, employees, inspectors, assignees, and transferees from any and all liability, claims, demands, actions, or causes of action of whatever kind or nature arising out of or in any way concerned with the Work under the Contract.

8. Guarantees and warranties for the Work, and any other continuing obligation of Contractor, shall remain in full force and effect as specified in the Contract Documents.

9. To the furthest extent permitted by California law, Contractor shall defend, indemnify, and hold harmless the County, its agents, representatives, officers, consultants, employees, trustees, and volunteers (the "indemnified parties") from any and all losses, liabilities, claims, suits, and actions of any kind, nature, and description, including, but not limited to, attorneys' fees and costs, directly or indirectly arising out of, connected with, or resulting from the performance of the Contract unless caused wholly by the sole negligence or willful misconduct of the indemnified parties.

10. Contractor hereby waives the provisions of California Civil Code section 1542 which provides as follows:

> A GENERAL RELEASE DOES NOT EXTEND TO CLAIMS WHICH THE CREDITOR DOES NOT KNOW OR SUSPECT TO EXIST IN HIS OR HER FAVOR AT THE TIME OF EXECUTING THE RELEASE, WHICH IF KNOWN BY HIM OR HER MUST HAVE MATERIALLY AFFECTED HIS OR HER SETTLEMENT WITH THE DEBTOR.

11. The provisions of this Agreement and Release are contractual in nature and not mere recitals and shall be considered independent and severable. If any such provision or any part thereof shall be at any time held invalid in whole or in part under any federal, state, county, municipal, or other law, ruling, or regulations,

then such provision, or part thereof, shall remain in force and effect to the extent permitted by law, and the remaining provisions of this Agreement and Release shall also remain in full force and effect, and shall be enforceable.

12. All rights of County shall survive completion of the Work or termination of Contract, and execution of this Release.

* * * CAUTION: THIS IS A RELEASE - READ BEFORE EXECUTING * * *

COUNTY OF ALAMEDA

TITLE: _____

NAME: _____

SIGNATURE: _____

CONTRACTOR

TITLE: _____

NAME: _____

SIGNATURE: _____

END OF DOCUMENT

DOCUMENT 00 65 36

WARRANTY FORM

_____("Contractor") hereby agrees that the _ _____ ("Work" of Contractor) which Contractor has installed for County of Alameda ("County") for the following project:

PROJECT: **ITD Headquarters 393-13th Street Renovations**

has been performed in accordance with the requirements of the Contract Documents and that the Work as installed will fulfill the requirements of the Contract Documents.

The undersigned agrees to repair or replace any or all of such Work that may prove to be defective in workmanship or material together with any other adjacent Work that may be displaced in connection with such replacement **within a period of two (2) years from the date of completion** as defined in Public Contract Code section 7107, subdivision (c), ordinary wear and tear and unusual abuse or neglect excepted. The date of completion is _____, **2018**.

In the event of the undersigned's failure to comply with the above-mentioned conditions within a reasonable period of time, as determined by County, but **not later than seven (7) days after being notified in writing by County**, the undersigned authorizes the County to proceed to have said defects repaired and made good at the expense of the undersigned. The undersigned shall pay the costs and charges therefor upon demand.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

Representatives to be contacted for service subject to terms of Contract:

NAME: _____

ADDRESS: _____

PHONE NO.: _____

END OF DOCUMENT

SECTION 00 72 13

GENERAL CONDITIONS

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GENERAL CONDITIONS

1. CONTRACT TERMS AND DEFINITIONS

1.1 Definitions

Wherever used in the Contract Documents, the following terms shall have the meanings indicated, which shall be applicable to both the singular and plural thereof:

1.1.1 Adverse Weather: Shall be only weather that satisfies all of the following conditions: (1) unusually severe precipitation, sleet, snow, hail, heat, or cold conditions in excess of the norm for the location and time of year it occurred, (2) unanticipated, and (3) at the Project.

1.1.2 Approval, Approved, and/or Accepted: Refer to written authorization, unless stated otherwise.

1.1.3 Architect: The individual, partnership, corporation, joint venture, or any combination thereof, named as Architect, who will have the rights and authority assigned to the Architect in the Contract Documents. The term Architect means the County's Architect on this Project or the Architect's authorized representative.

1.1.4 Architect's Supplemental Instruction: A document prepared by the Architect to provide supplemental instructions or interpretations or to order minor changes in the work not involving adjustment in the Contract Amount or Contract Time.

1.1.5 Bidder: A contractor who intends to provide a bid to the County to perform the Work of this Contract.

1.1.6 Change Order: A written order to the Contractor authorizing an addition to, deletion from, or revision in the Work, and/or authorizing an adjustment in the Contract Price or Contract Time.

1.1.7 Construction Change Directive: A written order prepared and issued by the County, the Construction Manager, and/or the Architect and signed by the County and the Architect, directing a change in the Work.

1.1.8 Construction Manager: The individual, partnership, corporation, joint venture, or any combination thereof, or its authorized representative, named as such by the County. If no Construction Manager is used on the Project that is the subject of this contract, then all references to Construction Manager herein shall be read to refer to County.

1.1.9 Construction Schedule: The progress schedule of construction of the Project as provided by Contractor and approved by County.

1.1.10 Contract, Contract Documents: The Contract consists exclusively of the documents evidencing the agreement of the County and Contractor, identified as the Contract Documents. The Contract Documents consist of the following documents:

1.1.10.1 Notice to Bidders

1.1.10.2 Instructions to Bidders

1.1.10.3 Supplementary Instructions to Bidders – Construction Outreach Program

1.1.10.4 Bid Form

1.1.10.5 Bid Security Form

1.1.10.6 Designated Subcontractors List

1.1.10.7 Site-Visit Certification, if a site visit was required.

1.1.10.8 Non-Collusion Affidavit

1.1.10.9 Workers' Compensation Certification

1.1.10.10 Prevailing Wage and Related Labor Requirements Certification

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1.1.10.24 Divisions 01 through 49

1.1.10.25 All Plans, Technical Specifications, and Drawings

1.1.10.26 Any and all addenda to any of the above documents

1.1.10.27 Any and all change orders or written modifications to the above documents if approved in writing by the County.

1.1.11 Contract Price: The total monies payable to the Contractor under the terms and conditions of the Contract Documents.

1.1.12 Contract Time: The time period stated in the Agreement for the completion of the Work.

1.1.13 Contractor: The person or persons identified in the Agreement as contracting to perform the Work to be done under this Contract, or the legal representative of such a person or persons.

1.1.14 County: County of Alameda, acting through its Board of Supervisors or any of its authorized agents. The County may, at any time:

1.1.14.1 Direct the Contractor to communicate with or provide notice to the Construction Manager or the Architect on matters for which the Contract Documents indicate the Contractor will communicate with or provide notice to the County; and/or

1.1.14.2 Direct the Construction Manager or the Architect to communicate with or direct the Contractor on matters for which the Contract Documents indicate the County will communicate with or direct the Contractor.

1.1.15 Daily Job Report(s): Daily Project reports prepared by the Contractor's employee(s) who are present on Site, which shall include the information required herein.

1.1.16 Day(s): Unless otherwise designated, day(s) means calendar day(s).

1.1.17 Drawings: (or "Plans") The graphic and pictorial portions of the Contract Documents showing the design, location, scope and dimensions of the work, generally including plans, elevations, sections, details, schedules, sequence of operation, and diagrams.

1.1.18 Force Account Directive: A process that may be used when the County and the Contractor cannot agree on a price for a specific portion of work or before the Contractor prepares a prices for a specific portion of work and whereby the Contractor performs the work as indicated herein on a time and materials basis.

1.1.19 Premises: The real property owned by the County on which the Site is located.

1.1.20 Product(s): New material, machinery, components, equipment, fixtures and systems forming the Work, including existing materials or components required and approved by the County for reuse.

1.1.21 Product Data: Illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate a material, product, or system for some portion of the Work.

1.1.22 Project: The planned undertaking as provided for in the Contract Documents.

1.1.23 Program Manager: The individual, partnership, corporation, joint venture, or any combination thereof, or its authorized representative, named as such by the County. If no Program Manager is designated for Project that is the subject of this Contract, then all references to Project Manager herein shall be read to refer to County.

1.1.24 Provide: Shall include "provide complete in place," that is, "furnish and install," and "provide complete and functioning as intended in place" unless specifically stated otherwise.

1.1.25 Request for Information: A written request prepared by the Contractor requesting that the Architect provide additional information necessary to clarify or amplify an item in the Contract Documents that the Contractor believes is not clearly shown or called for in the Drawings or Specifications or other portions of the Contract Documents, or to address problems that have arisen under field conditions.

1.1.26 Request for Substitution: A request by Contractor to substitute an equal or superior material, product, thing, or service for a specific material, product, thing, or service that has been designated in the Contract Documents by a specific brand or trade name.

1.1.27 Safety Orders: Written and/or verbal orders for construction issued by the California Division of Industrial Safety ("CalOSHA") or by the United States Occupational Safety and Health Administration ("OSHA").

1.1.28 Safety Plan: Contractor's safety plan specifically adapted for the Project. Contractor's Safety Plan shall comply with all provisions regarding Project safety, including all applicable provisions in these General Conditions.

1.1.29 Samples: Physical examples that illustrate materials, products, equipment, finishes, colors, or workmanship and that, when approved in accordance with the Contract Documents, establish standards by which portions of the Work will be judged.

1.1.30 Shop Drawings: All drawings, prints, diagrams, illustrations, brochures, schedules, and other data that are prepared by the Contractor, a subcontractor, manufacturer, supplier, or distributor, that illustrate how specific portions of the Work shall be fabricated or installed.

1.1.31 Site: The Project site as shown on the Drawings.

1.1.32 Specifications: That portion of the Contract Documents, Division 01 through Division 49, and all technical sections, and addenda to all of these, if any, consisting of written descriptions and requirements of a technical nature of materials, equipment, construction methods and systems, standards, and workmanship.

1.1.33 Subcontractor: A contractor and/or supplier who is under contract with the Contractor or with any other subcontractor, regardless of tier, to perform a portion of the Work of the Project.

1.1.34 Submittal Schedule: The schedule of submittals as provided by Contractor and approved by County.

1.1.35 Surety: The person, firm, or corporation that executes as surety the Contractor's Performance Bond and Payment Bond, and must be a California admitted surety insurer as defined in the Code of Civil Procedure Section 995.120.

1.1.36 Work: All labor, materials, equipment, components, appliances, supervision, coordination, and services required by, or reasonably inferred from, the Contract Documents, that are necessary for the construction and completion of the Project.

1.2 Laws Concerning The Contract

Contract is subject to all provisions of the Constitution and laws of California governing, controlling, or affecting County, or the property, funds, operations, or powers of County, and such provisions are by this reference made a part hereof. Any provision required by law to be included in this Contract shall be deemed to be inserted.

1.3 No Oral Agreements

No oral agreement or conversation with any officer, agent, or employee of County, either before or after execution of Contract, shall affect or modify any of the terms or obligations contained in any of the documents comprising the Contract.

1.4 No Assignment

Contractor shall not assign this Contract or any part thereof including, without limitation, any services or money to become due hereunder without the prior written consent of the County. Assignment without County's prior written consent shall be null and void. Any assignment of money due or to be come due under this Contract shall be subject to a prior lien for services rendered or material supplied for performance of work called for under this Contract in favor of all persons, firms, or corporations rendering services or supplying material to the extent that claims are filed pursuant to the Civil Code, Code of Civil Procedure, Government Code, Labor Code, and/or Public Contract Code, and shall also be subject to deductions for liquidated damages or withholding of payments as determined by County in accordance with this Contract. Contractor shall not assign or transfer in any manner to a Subcontractor or supplier the right to prosecute or maintain an action against the County.

1.5 Notice And Service Thereof

1.5.1 Any notice from one party to the other or otherwise under Contract shall be in writing and shall be dated and signed by the party giving notice or by a duly authorized representative of that party. Any notice shall not be effective for any purpose whatsoever unless served in one of the following manners:

1.5.1.1 If notice is given by personal delivery thereof, it shall be considered delivered on the day of delivery.

1.5.1.2 If notice is given by overnight delivery service, it shall be considered delivered on (1) day after date deposited, as indicated by the delivery service.

1.5.1.3 If notice is given by depositing same in United States mail, enclosed in a sealed envelope, it shall be considered delivered three (3) days after date deposited, as indicated by the postmarked date.

1.5.1.4 If notice is given by registered or certified mail with postage prepaid, return receipt requested, it shall be considered delivered on the day the notice is signed for.

1.6 No Waiver

The failure of County in any one or more instances to insist upon strict performance of any of the terms of this Contract or to exercise any option herein conferred shall not be construed as a waiver or relinquishment to any extent of the right to assert or rely upon any such terms or option on any future occasion. No action or failure to act by the County, Architect, or Construction Manager shall constitute a waiver of any right or duty afforded the County under the Contract, nor shall any action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

1.7 Substitutions For Specified Items

See Special Conditions.

1.8 Materials and Work

1.8.1 Except as otherwise specifically stated in this Contract, Contractor shall provide and pay for all materials, labor, tools, equipment, transportation, supervision, temporary constructions of every nature, and all other services, management, and facilities of every nature whatsoever necessary to execute and complete this Contract within the Contract Time.

1.8.2 Unless otherwise specified, all materials shall be new, and the best of their respective kinds and grades as noted or specified and workmanship shall be of good quality.

1.8.3 Materials shall be furnished in ample quantities and at such times as to ensure uninterrupted progress of Work and shall be stored properly and protected as required.

1.8.4 For all materials and equipment specified or indicated in the Drawings, the Contractor shall provide all labor, materials, equipment, and services necessary for complete assemblies and complete working systems, functioning as intended. Incidental items not indicated on Drawings, nor mentioned in the Specifications, that can legitimately and reasonably be inferred to belong to the Work described, or be necessary in good practice to provide a complete assembly or system, shall be furnished as though itemized here in every detail. In all instances, material and equipment shall be installed in strict accordance with each manufacturer's most recent published recommendations and specifications.

1.8.5 Contractor shall, after award of Contract by County and after relevant submittals have been approved, place orders for materials and/or equipment as specified so that delivery of same may be made without delays to the Work. Contractor shall, upon demand from County, present documentary evidence showing that orders have been placed.

1.8.6 County reserves the right but has no obligation, for any neglect in complying with the above instructions, to place orders for such materials and/or equipment as it may deem advisable in order that the Work may be completed at the date specified in the Agreement, and all expenses incidental to the procuring of said materials and/or equipment shall be paid for by Contractor or withheld from payment(s) to Contractor.

1.8.7 Contractor warrants good title to all material, supplies, and equipment installed or incorporated in Work and agrees upon completion of all Work to deliver the Site to County, together with all improvements and appurtenances constructed or placed thereon by it, and free from any claims, liens, or charges. Contractor further agrees that neither it nor any person, firm, or corporation furnishing any materials or labor for any work covered by the Contract shall have any right to lien any portion of the Premises or any improvement or appurtenance thereon, except that Contractor may install metering devices or other equipment of utility companies or of political subdivision, title to which is commonly retained by utility company or political subdivision. In the event of installation of any such metering device or equipment, Contractor shall advise County as to owner thereof.

1.8.8 Nothing contained in this Article, however, shall defeat or impair the rights of persons furnishing materials or labor under any bond given by Contractor for their protection or any rights under any law permitting such protection or any rights under any law permitting such persons to look to funds due Contractor in hands of County (e.g., Stop

Notices), and this provision shall be inserted in all subcontracts and material contracts and notice of its provisions shall be given to all persons furnishing material for work when no formal contract is entered into for such material.

1.8.9 Title to new materials and/or equipment for the Work of this Contract and attendant liability for its protection and safety shall remain with Contractor until incorporated in the Work of this Contract and accepted by County. No part of any materials and/or equipment shall be removed from its place of storage except for immediate installation in the Work of this Contract. Contractor shall keep an accurate inventory of all materials and/or equipment in a manner satisfactory to County or its authorized representative and shall, at the County's request, forward it to the County.

2. COUNTY

2.1 Occupancy

County reserves the right to occupy portions of the Project at any time before completion. Neither the County's Final Acceptance, the making of Final Payment, any provision in Contract Documents, nor the use or occupancy of the Work, in whole or in part, by County shall constitute acceptance of Work not in accordance with the Contract Documents nor relieve the Contractor or the Contractor's Performance Bond Surety from liability with respect to any warranties or responsibility for faulty or defective Work or materials, equipment and workmanship incorporated therein.

3. ARCHITECT

3.1 Role and Authority

The Architect shall represent County during the Project and will observe the progress and quality of the Work on behalf of County. Architect shall have the authority to act on behalf of County to the extent expressly provided in the Contract Documents and to the extent determined by County. Architect shall have authority to reject materials, workmanship, and/or the Work whenever rejection may be necessary, in Architect's reasonable opinion, to insure the proper execution of the Contract.

3.2 Interpretations

Architect shall, with County and on behalf of County, determine the amount, quality, acceptability, and fitness of all parts of the Work, and interpret the Specifications, Drawings, and shall, with County, interpret all other Contract Documents.

3.3 Laws

Architect shall have all authority and responsibility established by law, including Title 24 of the California Code of Regulations.

3.4 Communications

Contractor shall provide County and the Construction Manager with a copy of all written communication between Contractor and Architect at the same time as that communication is made to Architect, including, without limitation, all RFIs, correspondence, submittals, claims, and proposed change orders.

4. CONSTRUCTION MANAGER

4.1 Role and Authority

If a construction manager is used on this Project ("Construction Manager" or "CM"), the Construction Manager will provide administration of the Contract on the County's behalf. After execution of the Contract and Notice to Proceed, all correspondence, and/or instructions from Contractor and/or County shall be forwarded through the Construction Manager. The Construction Manager will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences, or procedures or for safety precautions in connection with the Work, which shall all remain the Contractor's responsibility.

4.2 Authority to Reject

The Construction Manager, however, will have authority to reject materials and/or workmanship not conforming to the Contract Documents, as determined by the County and/or the Architect. The Construction Manager shall also have the authority to require special inspection or testing of any portion of the Work, whether it has been fabricated, installed or fully completed. Any decision made by the Construction Manager, in good faith, shall not give rise to any duty or responsibility of the Construction Manager to the Contractor, any Subcontractor, their agents, employees, or other persons performing any of the Work. The Construction Manager shall have free access to any or all parts of the Work at any time.

4.3 If No Construction Manager

If the County does not use a Construction Manager on this Project, all references to Construction Manager or CM shall be read as County.

5. INSPECTIONS AND TESTS

5.1 Tests and Inspections

5.1.1 The County will select an independent testing laboratory to conduct tests. Selection of the materials required to be tested shall be by the laboratory or the County's representative and not by the Contractor. The Contractor shall notify the County's representative a sufficient time in advance of its readiness for required observation or inspection.

5.1.2 The Contractor shall notify the County's representative a sufficient time in advance of the manufacture of material to be supplied under the Contract Documents that must by terms of the Contract Documents be tested, in order that the County may arrange for the testing of same at the source of supply. This notice shall be, at a minimum, seventy-two (72) hours prior to the manufacture of the material that needs to be tested.

5.1.3 Any material shipped by the Contractor from the source of supply prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from said representative that such testing and inspection will not be required, shall not be incorporated into and/or onto the Project.

5.1.4 The County will select and pay testing laboratory costs for all tests and inspections. Costs of tests of any materials found to be not in compliance with the Contract Documents shall be paid for by the County and reimbursed by the Contractor or deducted from the Contract Price.

5.2 Costs for After Hours and/or Off Site Inspections

If the Contractor performs Work outside the County's regular working hours or requests the County to perform inspections off Site, costs of any inspections required outside regular working hours or off Site shall be borne by the Contractor and may be invoiced to the Contractor by the County or the County may deduct those expenses from the next Progress Payment.

6. CONTRACTOR

Contractor shall construct the Work for the Contract price including any adjustment(s) to the Contract Price pursuant to provisions herein regarding changes to the Contract Price. Except as otherwise noted, Contractor shall provide and pay for all labor, materials, equipment, permits, fees, licenses, facilities, transportation, taxes, and services necessary for the proper execution and completion of the Work, except as indicated herein.

6.1 Status of Contractor

6.1.1 Contractor is and shall at all times be deemed to be an independent contractor and shall be wholly responsible for the manner in which it and its Subcontractors perform the services required of it by the Contract Documents. Nothing herein contained shall be construed as creating the relationship of employer and employee, or principal and agent, between the County, or any of the County's employees or agents, and Contractor or any of Contractor's Subcontractors, agents or employees. Contractor assumes exclusively the responsibility for the acts of its employees as they relate to the services to be provided during the course and scope of their employment. Contractor, its agents, its employees and its Subcontractors shall not be entitled to any rights or privileges of County employees. County shall be permitted to monitor the Contractor's activities to determine compliance with the terms of this Contract.

6.1.2 As required by law, Contractor and all Subcontractors shall be properly licensed and regulated by the Contractor's State License Board, 3132 Bradshaw Road, Post Office Box 2600, Sacramento, California 98826, http://www.cslb.ca.gov.

6.2 Contractor's Supervision

6.2.1 At all times during progress of the Work, while any work is being performed, Contractor shall keep on the Premises, and at all other locations where any Work related to the Contract is being performed, a competent project manager and construction superintendent who are employees of the Contractor, to whom the County does not object and at least one of whom shall be fluent in English, written and verbal.

6.2.2 The project manager and construction superintendent shall both speak fluently the predominant language of the Contractor's employees fluently. All workers shall be sufficiently competent in English to respond to inquiries and instructions and give directions concerning matters of safety and concerning the identification and location of site foremen, the Contractor's construction superintendent and the Contractor's project manager.

6.2.3 Before commencing the Work herein, Contractor shall give written notice to County of the name and relevant credentials of its project manager and construction superintendent. Neither the Contractor's project manager nor construction superintendent shall be changed except with prior written notice to County and County's approval, unless the Contractor's project manager and/or construction superintendent proves to be unsatisfactory to Contractor, County, any of the County's employees, agents,

the Construction Manager, or the Architect, in which case, Contractor shall notify County in writing. The Contractor's project manager and construction superintendent shall each represent Contractor, and all directions given to Contractor's project manager and/or construction superintendent shall be as binding as if given to Contractor.

6.2.4 Contractor shall give efficient supervision to Work, using its best skill and attention. Contractor shall carefully study and compare all Contract Documents, Drawings, Specifications, and other instructions and shall at once report to County, Construction Manager, and Architect any error, inconsistency, or omission that Contractor or its employees and Subcontractors may discover, in writing. The Contractor shall have responsibility for discovery of errors, inconsistencies, or omissions.

6.3 Duty to Provide Fit Workers

6.3.1 Contractor and Subcontractor(s) shall at all times enforce strict discipline and good order among their employees and shall not employ or work any unfit person or anyone not skilled in work assigned to that person. It shall be the responsibility of Contractor to ensure compliance with this requirement. County may require Contractor to permanently remove unfit persons from Project Site.

6.3.2 Any person in the employ of Contractor or Subcontractor(s) whom County may deem incompetent or unfit shall be excluded from working on the Project and shall not again be employed on the Project except with the prior written consent of County.

6.3.3 The Contractor shall furnish labor that can work in harmony with all other elements of labor employed or to be employed in the Work.

6.3.4 If Contractor intends to make any change in the name or legal nature of the Contractor's entity, Contractor must first notify the County. The County shall determine if Contractor's intended change is permissible while performing this Contract.

6.4 Purchase of Materials and Equipment

The Contractor is required to order, obtain, and store materials and equipment sufficiently in advance of its Work at no additional cost or advance payment from County to assure that there will be no delays.

6.5 Documents On Work Site

6.5.1 Contractor shall at all times keep on the Work Site, or such other location as County may authorize in writing one legible copy of all Contract Documents, including Addenda and Change Orders, and titles 19 and 24 of the California Code of Regulations, the specified edition(s) of the Uniform Building Code, all approved Drawings, Plans, Schedules, and Specifications, and all codes and documents referred to in the Specifications, and made part thereof. These documents shall be kept in good order and available to County, Construction Manager, Architect, Architect's representatives, and all authorities having jurisdiction. Contractor shall be acquainted with and comply with the provisions of these titles as they relate to this Project. Contractor shall also be acquainted with and comply with all California Code of Regulations provisions relating to conditions on this Project. Contractor shall coordinate with Architect and Construction Manager.

6.5.2 Daily Job Reports. Contractor shall maintain, at a minimum, at least one (1) set of Daily Job Reports on the Project. These must be prepared by the Contractor's

employee(s) who are present on Site and must include, at a minimum, the following information:

6.5.2.1 A brief description of all Work performed on that day. This shall include a listing of what was done, which contractors were on site that day, and where on the site the work was performed.

6.5.2.2 A summary of all other pertinent events and/or occurrences on that day.

6.5.2.3 The weather conditions on that day.

6.5.2.4 A list of all Subcontractor(s) working on that day,

6.5.2.5 A list of each Contractor employee working on that day and the total hours worked for each employee.

6.5.2.6 A complete list of all equipment on Site that day, whether in use or not.

6.5.2.7 All complete list of all materials, supplies, and equipment delivered on that day.

6.5.2.8 A complete list of all inspections and tests performed on that day.

6.5.2.9 Each day Contractor shall provide a copy of the previous day's Daily Job Report to the County or the County's Construction Manager.

6.6 Preservation of Records

The County shall have the right to examine and audit all Daily Job Reports or other Project records of Contractor's project manager(s), project superintendent(s), and/or project foreperson(s), all certified payroll records and/or related documents including, without limitation, payroll, payment, timekeeping and tracking documents; all books, estimates, records, contracts, documents, bid documents, bid cost data, subcontract job cost reports, and other data of the Contractor, any Subcontractor, and/or supplier, including computations and projections related to bidding, negotiating, pricing, or performing the Work or Contract modification, in order to evaluate the accuracy, completeness, and currency of the cost, manpower, coordination, supervision, or pricing data at no additional cost to the County. These documents may be duplicative and/or be in addition to any Bid Documents held in escrow by the County. The Contractor shall make available at its office at all reasonable times the materials described in this paragraph for the examination, audit or reproduction until three (3) years after final payment under this Contract. Notwithstanding the provisions above, Contractor shall provide any records requested by any governmental agency if available, after the time set forth above.

6.7 Integration of Work

6.7.1 Contractor shall do all cutting, fitting, patching, and preparation of Work as required to make its several parts come together properly, to fit it to receive or be received by work of other contractors, and to coordinate tolerances to various pieces of work, showing upon, or reasonably implied by, the Drawings and Specifications for the completed structure, and shall conform them as County and/or Architect may direct.

6.7.2 All cost caused by defective or ill-timed Work shall be borne by Contractor, inclusive of repair work.

6.7.3 Contractor shall not endanger any work performed by it or anyone else by cutting, excavating, or otherwise altering work and shall not cut or alter work of any other contractor except with the consent of County.

6.8 Obtaining of Permits and Licenses

Contractor shall secure and pay for all permits, licenses, and certificates necessary for prosecution of Work before the date of the commencement of the Work or before the permits, licenses, and certificates are legally required to continue the Work without interruption. The Contractor shall obtain and pay, only when legally required, for all licenses, permits, inspections, and inspection certificates required to be obtained from or issued by any authority having jurisdiction over any part of the Work included in the Contract. All final permits, licenses, and certificates shall be delivered to County before demand is made for final payment.

6.9 Work to Comply With Applicable Laws and Regulations

6.9.1 Contractor shall give all notices and comply with the following specific laws, ordinances, rules, and regulations and all other applicable laws, ordinances, rules, and regulations bearing on conduct of Work as indicated and specified, including but not limited to the appropriate statutes and administrative code sections. If Contractor observes that Drawings and Specifications are at variance therewith, or should Contractor become aware of the development of conditions not covered by Contract Documents that will result in finished Work being at variance therewith, Contractor shall promptly notify County in writing, including by e-mail, and any changes deemed necessary by County shall be made as provided in Contract for changes in Work.

6.9.1.1 National Electrical Safety Code, U. S. Department of Commerce

6.9.1.2 National Board of Fire Underwriters' Regulations

6.9.1.3 Uniform Building Code, latest addition, and the California Code of Regulations, title 24, including amendments

6.9.1.4 Manual of Accident Prevention in Construction, latest edition, published by A.G.C. of America

6.9.1.5 Industrial Accident Commission's Safety Orders, State of California

6.9.1.6 Regulations of the State Fire Marshall (title 19, California Code of Regulations) and Pertinent Local Fire Safety Codes

6.9.1.7 Americans with Disabilities Act

6.9.1.8 Government Code of the State of California

6.9.1.9 Labor Code of the State of California, division 2, part 7, Public Works and Public Agencies

6.9.1.10 Public Contract Code of the State of California

6.9.1.11 California Art Preservation Act

6.9.1.12 U. S. Copyright Act

6.9.1.13 U. S. Visual Artists Rights Act

6.9.2 Contractor shall comply with all applicable mitigation measures, if any, adopted by any public agency with respect to this Project pursuant to the California Environmental Quality Act (Public Resources Code Section 21000 et. Seq.)

6.9.3 If Contractor performs any Work that it knew, or through exercise of reasonable care should have known, to be contrary to any applicable laws, ordinance, rules, or regulations, Contractor shall bear all costs arising therefrom.

6.9.4 Where Specifications or Drawings state that materials, processes, or procedures must be approved by the State Fire Marshall, or other body or agency, Contractor shall be responsible for satisfying requirements of such bodies or agencies.

6.10 Safety/Protection of Persons and Property

6.10.1 The Contractor will be solely and completely responsible for conditions of the Work Site, including safety of all persons and property during performance of the Work. This requirement will apply continuously and not be limited to normal working hours.

6.10.2 The wearing of hard hats will be mandatory at all times for all personnel on Site. Contractor shall supply sufficient hard hats to properly equip all employees and visitors.

6.10.3 Any construction review of the Contractor's performance is not intended to include a review of the adequacy of the Contractor's safety measures in, on, or near the Work Site.

6.10.4 Implementation and maintenance of safety programs shall be the sole responsibility of the Contractor.

6.10.5 The Contractor shall furnish to the County a copy of the Contractor's safety plan within the time frame indicated in the Contract Documents and specifically adapted for the Project.

6.10.6 Contractor shall be responsible for all damages to persons or property that occur as a result of its fault or negligence in connection with the prosecution of this Contract and shall take all necessary measures and be responsible for the proper care and completion and final acceptance by County. All Work shall be solely at Contractor's risk with the exception of damage to the Work caused by "acts of God" as defined in Public Contract Code Section 7105.

6.10.7 Contractor shall take, and require Subcontractors to take, all necessary precautions for safety of workers on the Project and shall comply with all applicable federal, state, local, and other safety laws, standards, orders, rules, regulations, and building codes to prevent accidents or injury to persons on, about, or adjacent to premises where Work is being performed and to provide a safe and healthful place of employment. Contractor shall furnish, erect, and properly maintain at all times, all necessary safety devices, safeguards, construction canopies, signs, nets, barriers, lights, and watchmen for protection of workers and the public and shall post danger signs warning against hazards created by such features in the course of construction.

6.10.8 Hazards Control – Contractor shall store volatile wastes in covered metal containers and remove them from the Site daily. Contractor shall prevent

the accumulation of wastes that create hazardous conditions. Contractor shall provide adequate ventilation during use of volatile or noxious substances.

6.10.9 Contractor shall designate a responsible member of its organization on the Project, whose duty shall be to post information regarding protection and obligations of workers and other notices required under occupational safety and health laws, to comply with reporting and other occupational safety requirements, and to protect the life, safety, and health of workers. Name and position of person so designated shall be reported to County by Contractor.

6.10.10 Contractor shall correct any violations of safety laws, rules, orders, standards, or regulations. Upon the issuance of a citation or notice of violation by the Division of Occupational Safety and Health, Contractor shall correct such violation promptly.

6.10.11 Contractor shall comply with any County storm water requirements that are approved by the County and applicable to the Project, at no additional cost to the County.

6.10.12 In an emergency affecting safety of life or of work or of adjoining property, Contractor, without special instruction or authorization, shall act, at its discretion, to prevent such threatened loss or injury. Any compensation claimed by Contractor on account of emergency work shall be determined by agreement.

6.10.13 All connections to public utilities and/or existing on-site services shall be made and maintained in such a manner as to not interfere with the continuing use of same by the County during the entire progress of the Work.

6.10.14 Contractor shall provide such heat, covering, and enclosures as are necessary to protect all Work, materials, equipment, appliances, and tools against damage by weather conditions, such as extreme heat, cold, rain, snow, dry winds, flooding, or dampness.

6.10.15 The Contractor shall protect and preserve the Work from all damage or accident, providing any temporary roofs, window and door coverings, boxing, or other construction. The Contractor shall be responsible for existing structures, walks, roads, trees, landscaping, and/or improvements in working areas; and shall provide adequate protection therefor. If temporary removal is necessary of any of the above items, or damage occurs due to the Work, the Contractor shall replace same at his expense with same kind, quality, and size of Work or item damaged. This shall include any adjoining property of the County and others.

6.10.16 Contractor shall take adequate precautions to protect existing roads, sidewalks, curbs, pavements, utilities, adjoining property, and structures (including, without limitation, protection from settlement or loss of lateral support), and to avoid damage thereto, and repair any damage thereto caused by construction operations.

6.10.17 Contractor shall confine apparatus, the storage of materials, and the operations of workers to limits indicated by law, ordinances, permits, or directions of Architect, and shall not interfere with the Work or unreasonably encumber Premises or overload any structure with materials. Contractor shall enforce all instructions of County and Architect regarding signs, advertising, fires, and smoking, and require that all workers comply with all regulations while on Project Site.

6.10.18 Contractor, Contractor's employees, Subcontractors, Subcontractors' employees, or any person associated with the Work shall conduct themselves in a manner appropriate for a public site. No verbal or physical contact with the public, neighbors, or tenants, or profanity, or inappropriate attire or behavior will be permitted. County may require Contractor to permanently remove non-complying persons from Project Site.

6.10.19 Contractor shall take care to prevent disturbing or covering any survey markers, monuments, or other devices marking property boundaries or corners. If such markers are disturbed, Contractor shall have a civil engineer, registered as a professional engineer in California, replace them at no cost to County.

6.10.20 In the event that the Contractor enters into any agreement with owners of any adjacent property to enter upon the adjacent property for the purpose of performing the Work, Contractor shall fully indemnify, defend, and hold harmless each person, entity, firm, or agency that owns or has any interest in adjacent property. The form and content of the agreement of indemnification shall be approved by the County prior to the commencement of any Work on or about the adjacent property. The Contractor shall also indemnify the County as provided in the indemnification provision herein. These provisions shall be in addition to any other requirements of the owners of the adjacent property.

6.11 Working Evenings and Weekends

Contractor may be required to work evenings and/or weekends at no additional cost to the County. Contractor shall give the County seventy-two (72) hours notice prior to performing any evening and/or weekend work. Contractor shall perform all evening and/or weekend work only upon County's approval and in compliance with all applicable rules, regulations, laws, and local ordinances including, without limitation, all noise and light limitations. Contractor shall reimburse the County for any expenses necessitated by the Contractor's evening and/or weekend work.

6.12 Badge Policy For Contractors

All Contractors doing work for Alameda County will provide their workers with identification badges. These badges will be worn by all members of the Contractor's staff who are working in a County facility.

6.12.1 Badges must be filled out in full and contain the following information:

6.12.1.1 Name of Contractor and Contractor's Company logo, if any

6.12.1.2 Name and front facial photograph of Employee

6.12.1.3 Contractor's address and phone number

6.12.1.4 Name and phone number of Project Manager (County)

6.12.2 Badges are to be worn when the Contractor or his/her employees are on site and must be visible at all times. Contractors must inform their employees that they are required to allow County employees to review the information on the badges upon request

6.12.3 Failure to display identification badges as required by this policy may result in the assessment of fines against the Contractor.

6.13 County Drug Policy - Drug-Free Work Place

6.13.1 Contractor, Contractor's employees, and Contractor's Subcontractors and their employees shall comply with the County's policy of maintaining a drug-free workplace. Neither Contractor/Subcontractor nor Contractor's/Subcontractor's employees shall unlawfully manufacture, distribute, dispense, possess or use controlled substances, as defined in 21 U.S. Code Section 812, including marijuana, heroin, cocaine, and amphetamines, at any County facility or work site. If Contractor or any employee of contractor is convicted or pleads nolo contendere to a criminal drug statute violation occurring at a County facility or work site, the Contractor within five (5) calendar days thereafter shall notify the head of the County department/agency for which the contract services are performed. Violation of this provision shall constitute a material breach of this contract.

6.14 Cleaning Up

6.14.1 The Contractor shall provide all services, labor, materials, and equipment necessary for protecting the Work, all Project occupants, furnishings, equipment, and building structure from damage until its completion and final acceptance by County. Dust barriers shall be provided to isolate dust and dirt from construction operations. At completion of the Work and portions thereof, Contractor shall clean to the original state any areas beyond the Work area that become dust laden as a result of the Work. The Contractor must erect the necessary warning signs and barricades to ensure the safety of all Project occupants. The Contractor at all times must maintain good housekeeping practices to reduce the risk of fire damage and must make a fire extinguisher, fire blanket, and/or fire watch, as applicable, available at each location where cutting, braising, soldering, and/or welding is being performed and locations where there is an increased risk of fire.

6.14.2 Contractor at all times shall keep Premises free from debris such as waste, rubbish, and excess materials and equipment caused by the Work. Contractor shall not leave debris under, in, or about the Premises, but shall promptly remove same from the Premises on a daily basis. If Contractor fails to clean up, County may do so, and the cost thereof shall be charged to Contractor. If Contract is for work on an existing facility, Contractor shall also perform specific clean-up on or about the Premises upon request by the County as it deems necessary for the continuing use of the facility. Contractor shall comply with all related provisions of the Specifications.

6.14.3 If the Construction Manager, Architect, or County observes the accumulation of trash and debris, the County will give the Contractor a 24-hour written notice to mitigate the condition.

6.14.4 Should the Contractor fail to perform the required clean-up, or should the clean-up be deemed unsatisfactory by the County, the County will then perform the clean-up. All cost associated with the clean-up work (including all travel, payroll burden, and costs for supervision) will be deducted from the Contract Price, or County may withhold those amounts from payment(s) to Contractor.

7. SUBCONTRACTORS

7.1 Contractor Shall Provide Subcontractor Information

Contractor shall provide the County with information for all Subcontracts as indicated in the Contractor's Submittals and Schedules Section herein.

7.2 No Contractual Relationship Between County and Subcontractors

No contractual relationship exists between the County and any Subcontractor, supplier, or sub-subcontractor supplier, or sub-subcontractor by reason of this Contract.

7.3 Contractor Binds Every Subcontractor by Terms of Contract

Contractor agrees to bind every Subcontractor by terms of Contract as far as those terms are applicable to Subcontractor's work If Contractor shall subcontract any part of this Contract, Contractor shall be as fully responsible to County for acts and omissions of any Subcontractor and of persons either directly or indirectly employed by any Subcontractor, as it is for acts and omissions of persons directly employed by Contractor. The divisions or sections of the Specifications are not intended to control the Contractor in dividing the Work among Subcontractors or limit the work performed by any trade.

7.4 No Waiver of Obligations

County's consent to, or approval of, or failure to object to, any Subcontractor under this Contract shall not in any way relieve Contractor of any obligations under this Contract and no such consent shall be deemed to waive any provisions of this Contract.

7.5 Contractor to Familiarize Itself with Laws

Contractor is directed to familiarize itself with sections 4100 through 4114 of the Public Contract Code of the State of California, as regards subletting and subcontracting, and to comply with all applicable requirements therein. In addition, Contractor is directed to familiarize itself with Sections 1720 through 1861 of the Labor Code of the State of California, as regards the payment of prevailing wages and related issues, and to comply with all applicable requirements therein all including, without limitation, Section 1775 and the Contractor's and Subcontractors' obligations and liability for violations of prevailing wage law and other applicable laws.

7.6 Subcontractor Substitutions

No Contractor whose Bid is accepted shall, without consent of the awarding authority and in full compliance with section 4100, et seq, of the Public Contract Code, including, without limitation, sections 4107, 4107.5, and 4109 of the Public Contract Code, either:

7.6.1 Substitute any person as a Subcontractor in place of the Subcontractor designated in the original Bid; or

7.6.2 Permit any Subcontract to be assigned or transferred, or allow any portion of the Work to be performed by anyone other than the original Subcontractor listed in the Bid; or

7.6.3 Sublet or subcontract any portion of the Work in excess of one-half of one percent (1/2 of 1%) of the Contractor's total bid as to which his original bid did not designate a Subcontractor.

7.7 Subcontractor Coordination

The Contractor shall be responsible for the coordination of the trades, Subcontractors, sub-subcontractors, and material or equipment suppliers working on the Project.

7.8 Subcontractor Relations

Contractor is solely responsible for settling any differences between the Contractor and its Subcontractor(s) or between Subcontractors.

7.9 Assignment or Termination

Contractor must include in all of its subcontracts the assignment provisions as indicated in the Termination section of these General Conditions.

8. OTHER CONTRACTS/CONTRACTORS

8.1 County Right to Perform

County reserves the right to let other contracts, and/or to perform work with its own forces, in connection with the Project. Contractor shall afford other County and other contractors' reasonable opportunity for introduction and storage of their materials and execution of their work and shall properly coordinate and connect Contractor's Work with the work of County and other contractors.

8.2 Protection of Work

In addition to Contractor's obligation to protect its own Work, Contractor shall protect the work of County and any other contractor that Contractor encounters while working on the Project.

8.3 Coordination with Other Work

If any part of Contractor's Work depends for proper execution or results upon work of County or any other contractor, the Contractor shall inspect and promptly report to the County in writing, including by e-mail, before proceeding with its Work any defects in County's or any other contractor's work that render Contractor's Work unsuitable for proper execution and results. Contractor shall be held accountable for damages to County for County's or any other contractor's work that Contractor failed to inspect or should have inspected. Contractor's failure to inspect and report shall constitute Contractor's acceptance of all County's or other contractor's work as fit and proper for reception of Contractor's Work, except as to defects that may develop in County's or other contractor's work after execution of Contractor's Work.

8.4 Measurement of Work Performed

To ensure proper execution of its subsequent work, Contractor shall measure and inspect work already in place and shall at once report to the County in writing, including by e-mail, any discrepancy between that executed work and the Contract Documents.

8.5 Knowledge of Other Work

Contractor shall ascertain to its own satisfaction the scope of the Project and nature of any County-performed work or other contracts that have been or may be awarded

by County in prosecution of the Project to the end that Contractor may perform this Contract in light of the other contracts, if any.

8.6 No Exclusive Occupancy of Site

Nothing herein contained shall be interpreted as granting to Contractor exclusive occupancy of the Site, the Premises, or of the Project. Contractor shall not cause any unnecessary hindrance or delay to the use and/or operation(s) of the Premises and/or to County or any other contractor working on the Project. If simultaneous execution of any contract or operation is likely to cause interference with performance of Contractor's Contract, Contractor shall coordinate with those contractor(s), person(s), and/or entity(s) and shall notify the County of the resolution.

9. DRAWINGS AND SPECIFICATIONS

9.1 List of all Drawings

A complete list of all Drawings that form a part of the Contract is to be found as an index on the Drawings themselves, and/or may be provided to the Contractor and/or in the Table of Contents.

9.2 Technical and Trade Words

Materials or Work described in words that so applied have a well-known technical or trade meaning shall be deemed to refer to recognized standards unless noted otherwise.

9.3 Trade Name or Trade Term

It is not the intention of this Contract to go into detailed descriptions of any materials and/or methods commonly known to the trade under "trade name" or "trade term." The mere mention or notation of "trade name" or "trade term" shall be considered a sufficient notice to Contractor that it will be required to complete the work so named, complete, finished, and operable, with all its appurtenances, according to the best practices of the trade.

9.4 The Naming of any Material and/or Equipment Shall Mean Furnishing

The naming of any material and/or equipment shall mean furnishing and installing of same, including all incidental and accessory items thereto and/or labor therefore, as per best practices of the trade(s) involved, unless specifically noted otherwise.

9.5 Contract Documents are Complementary

Contract Documents are complementary, and what is called for by one shall be binding as if called for by all. As such, Drawings and Specifications are intended to be fully cooperative and to agree. However, if Contractor observes that Drawings and Specifications are in conflict, Contractor shall promptly notify County and Architect in writing, including by e-mail, and any necessary changes shall be made as provided in the Contract Documents.

9.6 Drawings and Specifications are Intended to Comply With All Laws

Drawings and Specifications are intended to comply with all laws ordinances, rules, and regulations of constituted authorities having jurisdiction, and where referred to in the Contract Documents, the laws, ordinances, rules, and regulations shall be considered as

a part of the Contract within the limits specified. Contractor shall bear all expense of correcting work done contrary to said laws, ordinances, rules, and regulations.

9.7 Plans, Drawings, Designs, Specifications are County Property

All copies of Plans, Drawings, Designs, Specifications and copies of other incidental architectural and engineering work, or copies of other Contract Documents furnished by County, are the property of County. They are not to be used by Contractor in other work and, with the exception of signed sets of Contract Documents, are to be returned to County on request at completion of Work, or may be used by County as it may require without any additional costs to County. Neither the Contractor nor any Subcontractor, or material or equipment supplier shall own or claim copyright in the Drawings, Specifications, and other documents prepared by the Architect. County hereby grants the Contractor, Subcontractors, sub-subcontractors, and material or equipment suppliers a limited license to use applicable portions of the Drawings prepared for the Project in the execution of their Work under the Contract Documents.

9.8 Order of Precedence

In the case of discrepancy or ambiguity in the Contract Documents the order of precedence in the Agreement shall prevail.

9.9 Resolution of Discrepancy or Ambiguity

However, in the case of discrepancy or ambiguity solely between and among the Drawings and Specifications, the discrepancy or ambiguity shall be resolved in favor of the interpretation that will provide County with the functionally complete and operable Project described in the Drawings and Specifications.

9.10 County Clarification

In case of ambiguity, conflict, or lack of information, County will furnish clarifications with reasonable promptness. Should any clarification, in the opinion of Contractor, cause an increase in the Contract Price, Contractor may request a change in the Contract Price and/or Contract. Within seven (7) days after receipt of the interpretation or request, Contractor to submit to the Construction Manager a detailed description of the contract requirements that were exceeded and the resulting change in cost.

10. CONTRACTOR'S SUBMITTALS AND SCHEDULES

Refer to Section 01 33 00 "Submittal Requirements." Contractor's submittals shall comply with the provisions and requirements of the Specifications.

10.1 Schedule of Work, Schedule of Submittals, and Schedule of Values

Within TEN (10) calendar days after the date of the Notice to Proceed (unless otherwise specified in the Specifications), the Contractor shall prepare and submit to the County for review, in a form supported by sufficient data to substantiate its accuracy as the County may require:

10.1.1 Preliminary Schedule

A preliminary schedule of construction indicating the starting and completion dates of the various stages of the Work, including any information and following any form as may be specified in the Specifications. Once approved by County, this shall become the

Construction Schedule. This schedule shall include and identify all tasks that are on the Project's critical path with a specific determination of the start and completion of each critical path task as well as all contract milestones and each milestone's completion date(s) as may be required by the County.

10.1.2 Preliminary Schedule of Values

A preliminary schedule of values for all of the Work, which must include quantities and prices of items aggregating the Contract Price and must subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. This preliminary schedule of values shall include, at a minimum, the following information, and the following structure:

10.1.2.1 Divided into at least the following categories:

10.1.2.1.1 Overhead and profit;

10.1.2.1.2 Supervision;

10.1.2.1.3 General conditions;

10.1.2.1.4 Layout;

10.1.2.1.5 Mobilization;

10.1.2.1.6 Submittals;

10.1.2.1.7 Bonds and insurance;

10.1.2.1.8 Close-out documentation;

10.1.2.1.9 Demolition;

10.1.2.1.10 Installation;

10.1.2.1.11 Rough-in;

10.1.2.1.12 Finishes;

10.1.2.1.13 Testing;

10.1.2.1.14 Punch list and acceptance.

10.1.2.2 Divided by each of the following areas:

10.1.2.2.1 Site work;

10.1.2.2.2 By each building;

10.1.2.2.3 By each floor.

10.1.3 The preliminary schedule of values shall not provide for values any greater than the following percentages of the Contract value:

10.1.3.1 Mobilization and layout combined to equal not more than 1%;

10.1.3.2 Submittals, samples and shop drawings combined to equal not more than 3%, bonds and insurance combined to equal not more than 2%.

10.1.3.3 Closeout documentation shall have a value in the preliminary schedule of not less than 5%.

10.1.4 Notwithstanding any provision of the Contract Documents to the contrary, payment of the Contractor's overhead, supervision, general conditions costs, and profit, as reflected in the Cost Breakdown, shall be paid by the County in equal installments, based on percentage complete, with the disbursement of Progress Payments and the Final Payment.

10.1.5 Contractor shall certify that the preliminary schedule of values, as submitted to the County, is accurate and reflects the costs as developed in preparing Contractor's bid. The preliminary schedule of values shall be subject to the County's review and approval of the form and content thereof. In the event that the County objects to any portion of the preliminary schedule of values, the County shall notify the Contractor, in writing, including by e-mail, of the County's objection(s) to the preliminary schedule of values. Within five (5) calendar days of the date of the County's written objection(s), Contractor shall submit a revised preliminary schedule of values to the County for review and approval. The foregoing procedure for the preparation, review and approval of the preliminary schedule of values shall continue until the County has approved the entirety of the preliminary schedule of values.

10.1.6 Once the preliminary schedule of values is approved by the County, this shall become the Schedule of Values. The Schedule of Values shall not be thereafter modified or amended by the Contractor without the prior consent and approval of the County, which may be granted or withheld in the sole discretion of the County.

10.1.7 Preliminary Schedule of Submittals

A preliminary schedule of submittals, including Shop Drawings, Product Data, and Samples submittals. Once approved by County, this shall become the Submittal Schedule. All submittals shall be forwarded to the County by the date indicated on the approved Submittal Schedule, unless an earlier date is necessary to maintain the Construction Schedule, in which case those submittals shall be forwarded to the County so as not to delay the Construction Schedule.

10.1.8 Safety Plan

Contractor's Safety Plan specifically adapted for the Project. Contractor's Safety Plan shall comply with the following requirements:

10.1.8.1 All applicable requirements of California Division of Industrial Safety ("CalOSHA") and/or of the United States Occupational Safety and Health Administration ("OSHA").

10.1.8.2 All provisions regarding Project safety, including all applicable provisions of these General Conditions.

10.1.8.3 Contractor's Safety Plan shall be in English and in the language(s) of the Contractor's and its Subcontractors' employees.

10.1.9 Complete Subcontractor List

The name, address, telephone number, facsimile number, California State Contractors License number, classification, and monetary value of all Subcontracts for parties furnishing labor, material, or equipment for completion of the Project.

10.1.10 General Requirements

10.1.10.1 Contractor must provide all schedules both in hard copy and electronically, in a format (e.g., Microsoft Project or Primavera) approved in advance by the County.

10.1.10.2 The County will review the schedules submitted, and the Contractor shall make changes and corrections in the schedules as requested by the County and resubmit the schedules until approved by the County.

10.1.10.3 The County shall have the right at any time to revise the schedule of values if, in the County's sole opinion, the schedule of values does not accurately reflect the value of the Work performed.

10.1.10.4 All submittals and schedules must be approved by the County before Contractor can rely on them as a basis for payment.

10.2 Monthly Progress Schedule(s)

10.2.1 Upon request by the County, Contractor shall provide Monthly Progress Schedule(s) to the County. A Monthly Progress Schedule shall update the approved Construction Schedule or the last Monthly Progress Schedule, showing all work completed and to be completed. The monthly Progress Schedule shall be sent within the timeframe requested by the County and shall be in a format acceptable to the County and contain a written narrative of the progress of work that month and any changes, delays, or events that may affect the work. The process for County approval of the Monthly Progress Schedule shall be the same as the process for approval of the Construction Schedule.

10.2.2 Contractor shall also submit Monthly Progress Schedule(s) with all payment applications.

10.3 Material Safety Data Sheets (MSDS)

Contractor is required to ensure Material Safety Data Sheets are available in a readily accessible place at the Work Site for any material requiring a Material Safety Data Sheet per the Federal "Hazard Communication" standard, or employees right to know law. The Contractor is also required to ensure proper labeling on substance brought onto the job site and that any person working with the material or within the general area of the material is informed of the hazards of the substance and follows proper handling and protection procedures. Two additional copies of the Material Safety Data Sheets shall also be submitted directly to the County.

11. SITE ACCESS, CONDITIONS, AND REQUIREMENTS

11.1 Site Investigation

Before bidding on this Work, Contractor shall make a careful investigation of the Site and thoroughly familiarize itself with the requirements of the Contract. By the act of submitting a bid for the Work included in this Contract, Contractor shall be deemed to have made a complete study and investigation, and to be familiar with and accepted the existing conditions of the Site.

11.2 Soils Investigation Report

11.2.1 When a soils investigation report obtained from test holes at Site is available, that report shall be available to the Contractor but shall not be a part of this Contract. Any information obtained from that report or any information given on

Drawings as to subsurface soil condition or to elevations of existing grades or elevations of underlying rock is approximate only, is not guaranteed, does not form a part of this Contract, and Contractor may not rely thereon. By submitting its bid, Contractor acknowledges that it has made a visual examination of Site and has made whatever tests Contractor deems appropriate to determine underground condition of the soil.

11.2.2 Contractor agrees that no claim against County will be made by Contractor for damages and hereby waives any rights to damages if, during progress of Work, Contractor encounters subsurface or latent conditions at Site materially differing from those shown on Drawings or indicated in Specifications, or for unknown conditions of an unusual nature that differ materially from those ordinarily encountered in the work of the character provided for in Plans and Specifications, except as indicated in the provisions of these General Conditions regarding trenches, trenching, and/or existing utility lines.

11.3 Access to Work

County and its representatives shall at all times have access to Work wherever it is in preparation or progress, including storage and fabrication. Contractor shall provide safe and proper facilities for such access so that County's representatives may perform their functions.

11.4 Layout and Field Engineering

11.4.1 All field engineering required for layout of this Work and establishing grades for earthwork operations shall be furnished by Contractor at its expense. This Work shall be done by a qualified, California-registered civil engineer approved in writing by County and Architect. Any required "Record" drawings of Site development shall be prepared by the approved civil engineer.

11.4.2 The Contractor shall be responsible for having ascertained pertinent local conditions such as location, accessibility, and general character of the Site and for having satisfied itself as to the conditions under which the Work is to be performed. County shall not be liable for any claim for allowances because of Contractor's error or negligence in acquainting itself with the conditions at the Site.

11.4.3 Contractor shall protect and preserve established benchmarks and monuments and shall make no changes in locations without the prior written approval of County. Contractor shall replace any benchmarks or monuments that are lost or destroyed subsequent to proper notification of County and with County's approval.

11.5 Utilities

Utilities shall be provided as indicated in the Specifications.

11.6 Sanitary Facilities

Sanitary facilities shall be provided as indicated in the Specifications.

11.7 Surveys

Contractor shall provide surveys done by a California-licensed civil engineer surveyor to determine locations of construction, grading, and site work as required to perform the Work.

11.8 Regional Notification Center

The Contractor, except in an emergency, shall contact the appropriate regional notification center at least two (2) days prior to commencing any excavation if the excavation will be conducted in an area or in a private easement that is known, or reasonably should be known, to contain subsurface installations other than the underground facilities owned or operated by the County, and obtain an inquiry identification number from that notification center. No excavation shall be commenced and/or carried out by the Contractor unless an inquiry identification number has been assigned to the Contractor or any Subcontractor, and the Contractor has given the County the identification number. Any damages arising from Contractor's failure to make appropriate notification shall be at the sole risk and expense of the Contractor. Any delays caused by failure to make appropriate notification shall be at the sole risk of the Contractor and shall not be considered for an extension of the Contract time.

11.9 Existing Utility Lines

11.9.1 Pursuant to Government Code Section 4215, County assumes the responsibility for removal, relocation, and protection of main or trunk utility lines and facilities located on the construction Site at the time of commencement of construction under this Contract with respect to any such utility facilities that are not identified in the Plans and Specifications. Contractor shall not be assessed for liquidated damages for delay in completion of the Project caused by failure of County or the owner of a utility to provide for removal or relocation of such utility facilities.

11.9.2 Locations of existing utilities provided by County shall not be considered exact, but approximate within reasonable margin and shall not relieve Contractor of responsibilities to exercise reasonable care nor costs of repair due to Contractor's failure to do so. County shall compensate Contractor for the costs of locating, repairing damage not due to the failure of Contractor to exercise reasonable care, and removing or relocating such utility facilities not indicated in the Plans and Specifications with reasonable accuracy, and for equipment necessarily idle during such work.

11.9.3 No provision herein shall be construed to preclude assessment against Contractor for any other delays in completion of the Work. Nothing in this Article shall be deemed to require County to indicate the presence of existing service laterals, appurtenances, or other utility lines, with the exception of main or trunk utility lines. Whenever the presence of these utilities on the Site of the construction Project can be inferred from the presence of other visible facilities, such as buildings, meter junction boxes, on or adjacent to the Site of the construction.

11.9.4 If Contractor, while performing Work under this Contract, discovers utility facilities not identified by County in Contract Plans and Specifications, Contractor shall immediately notify the County and the utility in writing. The cost of repair for damage to above-mentioned visible facilities without prior written notification to the County shall be borne by the Contractor.

11.10 Notification

Contractor understands, acknowledges and agrees that the purpose for prompt notification to the County pursuant to these provisions is to allow the County to investigate the condition(s) so that the County shall have the opportunity to decide how the County desires to proceed as a result of the condition(s). Accordingly, failure of Contractor to promptly notify the County in writing, including by e-mail, pursuant to these provisions,

shall constitute Contractor's waiver of any claim for damages or delay incurred as a result of the condition(s).

11.11 Hazardous Materials

Contractor shall comply with all provisions and requirements of the Contract Documents related to hazardous materials including, without limitation, Hazardous Materials Procedures and Requirements.

11.12 No Signs

Neither the Contractor nor any other person or entity shall display any signs not required by law or the Contract Documents at the Site, fences trailers, offices, or elsewhere on the Site without specific prior written approval of the County.

12. TRENCHES

12.1 Trenches Greater Than Five Feet

Pursuant to Labor Code Section 6705, if the Contract Price exceeds $25,000 and involves the excavation of any trench or trenches five (5) feet or more in depth, the Contractor shall, in advance of excavation, promptly submit to the County and/or a registered civil or structural engineer employed by the County or Architect, a detailed plan showing the design of shoring for protection from the hazard of caving ground during the excavation of such trench or trenches.

12.2 Excavation Safety

If such plan varies from the Shoring System Standards established by the Construction Safety Orders, the plan shall be prepared by a registered civil or structural engineer, but in no case shall such plan be less effective than that required by the Construction Safety Orders. No excavation of such trench or trenches shall be commenced until said plan has been accepted by the County or by the person to whom authority to accept has been delegated by the County.

12.3 No Tort Liability of County

Pursuant to Labor Code section 6705, nothing in this Article shall impose tort liability upon the County or any of its employees.

12.4 No Excavation Without Permits

The Contractor shall not commence any excavation Work until it has secured all necessary permits including the required CalOSHA excavation/shoring permit. Any permits shall be prominently displayed on the Site prior to the commencement of any excavation.

12.5 Discovery of Hazardous Waste and/or Unusual Conditions

12.5.1 Pursuant to Public Contract Code Section 7104, if the Work involves digging trenches or other excavations that extend deeper than four feet below the Surface, the Contractor shall promptly, and before the following conditions are disturbed, notify the County, in writing, including by e-mail, of any:

12.5.1.1 Material that the Contractor believes may be material that is hazardous waste, as defined in Section 25117 of the Health and Safety

Code that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.

12.5.1.2 Subsurface or latent physical conditions at the Site differing from those indicated.

12.5.1.3 Unknown physical conditions at the Site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract.

12.5.2 The County shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the Work, shall issue a Change Order under the procedures described herein.

12.5.3 In the event that a dispute arises between County and the Contractor whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or time required for, performance of any part of the Work, the Contractor shall not be excused from any scheduled completion date provided for in the Contract, but shall proceed with all work to be performed under the Contract. The Contractor shall retain any and all rights provided either by Contract or by law that pertain to the resolution of disputes and protests.

13. INSURANCE AND BONDS

13.1 Insurance

All insurance required of Contractor and/or its Subcontractor(s) shall be in amounts set forth in the Special Conditions, and include the provisions as set forth herein.

13.1.1 Commercial General Liability and Automobile Liability Insurance

13.1.1.1 Contractor shall procure and maintain, during the life of this Contract, Commercial General Liability Insurance and Automobile Liability Insurance that shall protect Contractor, County, Construction Manager(s), and Architect(s) from all claims for bodily injury, property damage, personal injury, death, advertising injury, and medical payments arising from operations under this Contract. Contractor shall ensure that Products Liability and Completed Operations coverage and Fire Damage Liability is included within the above policies and within the required limits, or Contractor shall procure and maintain these coverages separately.

13.1.1.2 Subcontractor: Contractor shall require its Subcontractors if any, to procure and maintain similar Commercial General Liability Insurance and Automobile Liability Insurance with minimum limits equal to the amount required of the Contractor. Contractor shall verify Subcontractor's compliance.

13.1.2 Excess Liability Insurance

13.1.2.1 Contractor shall procure and maintain, during the life of this Contract, Excess Liability Insurance that shall protect Contractor, County, Construction Manager(s), and Architect(s) in amounts and including

the provisions as set forth in the Special Conditions, and that complies with all requirements for Commercial General Liability and Automobile Liability and Employers' Liability Insurance.

13.1.2.2 Subcontractor: Contractor shall require its Subcontractor(s) if any, to procure and maintain similar Excess Liability Insurance with minimum limits equal to the amount required of the Contractor. Contractor shall verify Subcontractor's compliance.

13.1.3 Workers' Compensation and Employers' Liability Insurance

13.1.3.1 In accordance with provisions of Section 3700 of the California Labor Code, the Contractor and every Subcontractor shall be required to secure the payment of compensation to its employees.

13.1.3.2 Contractor shall procure and maintain, during the life of this Contract, Workers' Compensation Insurance and Employers' Liability Insurance for all of its employees engaged in work under this Contract, on/or at the Site of the Project. This coverage shall cover, at a minimum, medical and surgical treatment, disability benefits, rehabilitation therapy, and survivors' death benefits. Contractor shall require its Subcontractor(s) if any, to procure and maintain Workers' Compensation Insurance and Employers' Liability Insurance for all employees of Subcontractor(s). Any class of employee or employees not covered by a Subcontractor's insurance shall be covered by Contractor's insurance. If any class of employee or employees engaged in Work under this Contract, on or at the Site of the Project, is not protected under the Workers' Compensation Statute, Contractor shall provide, or shall cause a Subcontractor to provide, adequate insurance coverage for the protection of any employee(s) not otherwise protected before any of those employee(s) commence work.

13.1.4 Builder's Risk Insurance: Builder's Risk "All-Risk" Insurance.

Contractor shall procure and maintain, during the life of this Contract, Builder's Risk (Course of Construction), or similar first party property coverage acceptable to the County, issued on a replacement cost value basis. The cost shall be consistent with the total replacement cost of all insurable Work of the Project included within the Contract Documents. Coverage is to insure against all risks of accidental physical loss and shall include without limitation the perils of vandalism and/or malicious mischief (both without any limitation regarding vacancy or occupancy), sprinkler leakage, civil authority, sonic disturbance, earthquake, flood, collapse, wind, fire, war, terrorism, lightning, smoke, and rioting. Coverage shall include debris removal, demolition, increased costs due to enforcement of all applicable ordinances and/or laws in the repair and replacement of damaged and undamaged portions of the property, and reasonable costs for the Architect's and engineering services and expenses required as a result of any insured loss upon the Work and Project, including completed Work and Work in progress, to the full insurable value thereof.

13.1.5 Proof of Carriage of Insurance and Other Requirements: Endorsements and Certificates.

13.1.5.1 Contractor shall not commence Work nor shall it allow any Subcontractor to commence Work under this Contract, until Contractor and its Subcontractor(s) have procured all required insurance and Contractor has delivered in duplicate to the County complete endorsements (or entire insurance policies) and certificates indicating the required coverages have been obtained, and the County has approved these documents.

13.1.5.2 Endorsements, certificates, and insurance policies shall include the following:

13.1.5.2.1 A clause stating:

"This policy shall not be amended, canceled or modified and the coverage amounts shall not be reduced until notice has been mailed to County, Architect, and Construction Manager stating date of amendment, modification, cancellation or reduction. Date of amendment, modification, cancelation or reduction may not be less than thirty (30) days after date of mailing notice."

13.1.5.2.2 Language stating in particular those insured, extent of insurance, location and operation to which insurance applies, expiration date, to whom cancelation and reduction notice will be sent, and length of notice period.

13.1.5.3 All endorsements, certificates and insurance policies shall state that County, its Supervisors, employees, and agents, Construction Manager(s), and Architect(s) are named additional insureds under all policies except Workers' Compensation Insurance and Employers' Liability Insurance. Contractor's and Subcontractors' insurance policy(s) shall be primary and non-contribution to any insurance or self-insurance maintained by County, its Supervisors, employees and/or agents, Construction Manager(s), and/or Architect(s). All endorsements shall waive any right to subrogation against any of the named additional insureds.

13.1.5.4 All policies shall be written on an occurrence form.

13.2 Contract Security - Bonds

13.2.1 Contractor shall furnish two surety bonds issued by a California admitted surety insurer as follows:

13.2.1.1 Performance Bond: A bond in an amount at least equal to one hundred percent (100%) of Contract Price as security for faithful performance of this Contract.

13.2.1.2 Payment Bond: A bond in an amount at least equal to one hundred percent (100%) of the Contract Price as security for payment of persons performing labor and/or furnishing materials in connection with this Contract.

13.2.2 Cost of bonds shall be included in the Bid and Contract Price.

13.2.3 All bonds related to this Project shall be in the forms set forth in these Contract Documents and shall comply with all requirements of the Contract Documents, including, without limitation, the bond forms.

14. WARRANTY/GUARANTEE/INDEMNITY

14.1 Warranty/Guarantee

14.1.1 The Contractor shall obtain and preserve for the benefit of the County, manufacturer's warranties on materials, fixtures, and equipment incorporated into the Work.

14.1.2 In addition to guarantees required elsewhere, Contractor shall, and hereby does guarantee and warrant all Work furnished on the job against all defects for a period of TWO (2) years after the later of the following dates:

14.1.2.1 The date of completion as defined in Public Contract Code Section 7107, subdivision (c),

14.1.2.2 The commissioning date for the Project, if any.

14.1.3 At the County's sole option, Contractor shall repair or replace any and all of that Work, together with any other Work that may be displaced in so doing, that may prove defective in workmanship and/or materials within the warranty period specified in Section 00 65 36 Warranty Form, from date of completion as defined above without expense whatsoever to County. In the event of failure of Contractor and/or Surety to commence and pursue with diligence said replacements or repairs within ten (10) days after being notified in writing, including by e-mail, Contractor and Surety hereby acknowledge and agree that County is authorized to proceed to have defects repaired and made good at expense of Contractor and/or Surety who hereby agree to pay costs and charges therefore immediately on demand. Said notice period shall be forty-eight (48) hours for components essential to operation of the facility, including without limitation fire alarms, water, heat, security systems, and electrical systems.

14.1.4 If, in the opinion of County, defective work creates a dangerous condition or requires immediate correction or attention to prevent further loss to County or to prevent interruption of operations of County, County will attempt to give the notice required above. If Contractor or Surety cannot be contacted or does not comply with County's request for correction within a reasonable time as determined by County, County may, notwithstanding the above provision, proceed to make any and all corrections and/or provide attentions the County believes are necessary. The costs of correction or attention shall be charged against Contractor and Surety of the guarantees provided in this Article or elsewhere in this Contract.

14.1.5 The above provisions do not in any way limit the guarantees on any items for which a longer guarantee is specified or on any items for which a manufacturer gives a guarantee for a longer period. Contractor shall furnish to County all appropriate guarantee or warranty certificates as indicated in the Specifications or upon request by County.

14.1.6 Nothing herein shall limit any other rights or remedies available to County.

14.2 Indemnity

14.2.1 To the fullest extent permitted by California law, the Contractor shall indemnify, defend with legal counsel reasonably acceptable to the County, keep and hold harmless the County and its consultants, the Architect and its consultants, the Construction Manager and its consultants, separate contractors, and their respective board members, officers, representatives, contractors, agents, and employees, in both individual and official capacities ("Indemnitees"), against all suits, claims, liabilities, damages, losses, and expenses caused by, arising out of, resulting from, or incidental to, the performance of the Work under this Contract by the Contractor or its Subcontractors to the full extent allowed by the laws of the State of California, and not to any extent that would render these provisions void or unenforceable, including, without limitation, any such suit, claim, damage, loss, or expense attributable to, without limitation, bodily injury, sickness, disease, death, alleged patent violation or copyright infringement, or to injury to or destruction of tangible property (including damage to the Work itself) including the loss of use resulting therefrom, except to the extent caused solely by the negligence, or willful misconduct of the Indemnitees. The County may participate in the defense of any such claim without relieving Contractor of any obligation hereunder. This agreement and obligation of the Contractor shall not be construed to negate, abridge, or otherwise reduce any right or obligation of indemnity that would otherwise exist as to any party or person described herein. This indemnification, defense, and hold harmless obligation includes any failure or alleged failure by Contractor to comply with any provision of law or the Contract Documents, including, without limitation, any stop notice actions, or liens by the California Department of Labor Standards Enforcement. This indemnity obligation shall be for the full amount of all damage to County, including defense costs, and shall not be limited by any insurance limits.

14.2.2 The Contractor shall give prompt notice to the County in the event of any injury (including death), loss or damage included herein. Without limitation of the provisions herein, if the Contractor's agreement to indemnify, defend, and hold harmless the Indemnitees as provided herein against liability for damage arising out of bodily injury to persons or damage to property caused by or resulting from the negligence of any of the Indemnitees shall to any extent be or be determined to be void or unenforceable, it is the intention of the parties that these circumstances shall not otherwise affect the validity or enforceability of the Contractor's agreement to indemnify, defend, and hold harmless the rest of the Indemnitees, as provided herein, and in the case of any such suits, claims, damages, losses, or expenses caused in part by the default, negligence, or act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, and in part by any of the Indemnitees, the Contractor shall be and remain fully liable on its agreements and obligations herein to the full extent permitted by law.

14.2.3 In any and all claims against any of the Indemnitees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the Contractor's indemnification obligation herein shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the Contractor or any Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

14.2.4 Contractor shall place in its Subcontractor agreements and cause its Subcontractors to agree to indemnities and insurance obligations in favor of County and

other Indemnities in the exact form and substance of those contained in these General Conditions (00 72 13). Contractor shall require all Subcontractors to comply with all indemnification and insurance requirements of this agreement. Contractor shall verify Subcontractor's compliance.

15. TIME

15.1 Notice to Proceed

15.1.1 County may issue a Notice to Proceed within three (3) months from the date of the Notice of Award. Once Contractor has received the Notice to Proceed, Contractor shall complete the Work within the period of time indicated in the Contract Documents.

15.1.2 In the event that the County desires to postpone issuing the Notice to Proceed beyond this 3-month period, it is expressly understood that with reasonable notice to the Contractor, the County may postpone issuing the Notice to Proceed. It is further expressly understood by Contractor that Contractor shall not be entitled to any claim of additional compensation as a result of the postponement of the issuance of the Notice to Proceed.

15.1.3 If the Contractor believes that a postponement of issuance of the Notice to Proceed will cause a hardship to Contractor, Contractor may terminate the Contract. Contractor's termination due to a postponement shall be by written notice to County within ten (10) days after receipt by Contractor of County's notice of postponement. It is further understood by Contractor that in the event that Contractor terminates the Contract as a result of postponement by the County, the County shall only be obligated to pay Contractor for the Work that Contractor had performed at the time of notification of postponement. Should Contractor terminate the Contract as a result of a notice of postponement, County shall have the authority to award the Contract to the next lowest responsive, responsible bidder.

15.2 Computation of Time / Adverse Weather

15.2.1 The Contractor will only be allowed a time extension for Adverse Weather conditions if requested by Contractor and only if all of the following conditions are met:

15.2.1.1 The weather conditions constitute Adverse Weather, as defined herein and further specified in the Special Conditions;

15.2.1.2 Contractor can verify that the Adverse Weather caused delays in excess of seventy-five percent (75%) for at least five hours, of the normal labor and equipment force toward completion of the day's current controlling item(s) on the latest accepted schedule;

15.2.1.3 The Contractor's crew is dismissed as a result of the Adverse Weather; and

15.2.1.4 The number of days of delay for the month exceeds those indicated in the Special Conditions.

15.2.2 A day-for-day extension will only be allowed for those days in excess of those indicated in the Special Conditions. Weather delay time extensions to the contract period will be non-compensable.

15.2.3 The Contractor shall work seven (7) days per week, if necessary, irrespective of inclement weather, to maintain access and the Construction Schedule, and to protect the Work under construction from the effects of Adverse Weather, all at no further cost to the County.

15.2.4 The Contract Time has been determined with consideration given to the average climate weather conditions prevailing in the County in which the Project is located.

15.3 Hours of Work

15.3.1 Sufficient Forces

Contractor and Subcontractors shall continuously furnish sufficient forces to ensure the prosecution of the Work in accordance with the Construction Schedule.

15.3.2 Performance During Working Hours

Work shall be performed during regular working hours as permitted by the appropriate governmental agency except that in the event of an emergency, or when required to complete the Work in accordance with job progress, Work may be performed outside of regular working hours with the advance written consent of the County and approval of any required governmental agencies.

15.4 Progress and Completion

15.4.1 Time of the Essence

Time limits stated in the Contract Documents are of the essence to the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

15.4.2 No Commencement Without Insurance

The Contractor shall not commence operations on the Project or elsewhere prior to the effective date of insurance and bonds. The date of commencement of the Work shall not be changed by the effective date of such insurance. If Contractor commences Work without insurance and bonds, all Work is performed at Contractor's peril and shall not be compensable until and unless Contractor secures bonds and insurance pursuant to the terms of the Contract Documents and subject to County claim for damages.

15.5 Expeditious Completion

The Contractor shall proceed expeditiously with adequate forces and shall achieve Completion within the Contract Time.

16. EXTENSIONS OF TIME – LIQUIDATED DAMAGES

16.1 Liquidated Damages

Contractor and County hereby agree that the exact amount of damages for failure to complete the Work within the time specified is extremely difficult or impossible to determine. If the Work is not completed within the time specified in the Contract Documents, it is understood that the County will suffer damage. It being impractical and unfeasible to determine the amount of actual damage, it is agreed the Contractor shall pay to County as fixed and liquidated damages, and not as a penalty, the amount set forth in the

Agreement for each calendar day of delay in completion. Contractor and its Surety shall be liable for the amount thereof pursuant to Government Code Section 53069.85.

16.2 Excusable Delay

16.2.1 Contractor shall not be charged for liquidated damages because of any delays in completion of Work which are not the fault of Contractor or its Subcontractors, including acts of God as defined in Public Contract Code Section 7105, acts of enemy, epidemics, and quarantine restrictions. Contractor shall, within five (5) calendar days of beginning of any delay, notify County in writing of causes of delay including documentation and facts explaining the delay. County shall review the facts and extent of any delay and shall grant extension(s) of time for completing Work when, in its judgment, the findings of fact justify an extension. Extension(s) of time shall apply only to that portion of Work affected by delay, and shall not apply to other portions of Work not so affected. An extension of time may only be granted if Contractor has timely submitted the Construction Schedule as required herein.

16.2.2 Contractor shall notify the County pursuant to the claims provisions in these General Conditions of any anticipated delay and its cause. Following submission of a claim, the County may determine whether the delay is to be considered avoidable or unavoidable, how long it continues, and to what extent the prosecution and completion of the Work might be delayed thereby.

16.2.3 In the event the Contractor requests an extension of Contract Time for unavoidable delay, such request shall be submitted in accordance with the provisions in the Contract Documents governing changes in Work. When requesting time, requests must be submitted with full justification and documentation. If the Contractor fails to submit justification, it waives its right to a time extension at a later date. Such justification must be based on the official Construction Schedule as updated at the time of occurrence of the delay or execution of Work related to any changes to the Scope of Work. Any claim for delay must include the following information as support, without limitation:

16.2.3.1 The duration of the activity relating to the changes in the Work and the resources (manpower, equipment, material, etc.) required to perform the activities within the stated duration.

16.2.3.2 Specific logical ties to the Contract Schedule for the proposed changes and/or delay showing the activity/activities in the Construction Schedule that are affected by the change and/or delay.

16.2.3.3 A recovery schedule must be submitted.

16.3 No Additional Compensation for Delays Within Contractor's Control

16.3.1 Contractor is aware that governmental agencies, including, without limitation, the Department of General Services, gas companies, electrical utility companies, water companies, and other agencies may have to approve Contractor-prepared drawings or approve a proposed installation. Accordingly, Contractor shall include in its bid, time for possible review of its drawings and for reasonable delays and damages that may be caused by such agencies. Thus, Contractor is not entitled to make a claim for damages or delays arising from the review of Contractor's drawings.

16.3.2 Contractor shall only be entitled to compensation for delay when all of the following conditions are met:

16.3.2.1 The County is responsible for the delay;

16.3.2.2 The delay is unreasonable under the circumstances involved;

16.3.2.3 The delay was not within the contemplation of County and Contractor; and

16.3.2.4 Contractor complies with the claims procedure of the Contract Documents.

16.4 Float or Slack in the Schedule

Float or slack is the amount of time between the early start date and the late start date, or the early finish date and the late finish date, of any of the activities in the schedule. Float or slack is not for the exclusive use of or benefit of either the County or the Contractor, but its use shall be determined solely by the County.

17. CHANGES IN THE WORK

17.1 No Changes Without Authorization

17.1.1 There shall be no change whatsoever in the Drawings, Specifications, or in the Work without an executed Change Order or a written Construction Change Directive authorized by the County as herein provided. County shall not be liable for the cost of any extra work or any substitutions, changes, additions, omissions, or deviations from the Drawings and Specifications unless the County's governing board has authorized the same and the cost thereof has been approved in writing by Change Order or Construction Change Directive. No extension of time for performance of the Work shall be allowed hereunder unless claim for such extension is made at the time changes in the Work are ordered, and such time duly adjusted in writing in the Change Order or Construction Change Directive. The provisions of the Contract Documents shall apply to all such changes, additions, and omissions with the same effect as if originally embodied in the Drawings and Specifications.

17.1.2 Contractor shall perform immediately all work that has been authorized by a fully executed Change Order or Construction Change Directive. Contractor shall be fully responsible for any and all delays and/or expenses caused by Contractor's failure to expeditiously perform this Work.

17.1.3 Should any Change Order result in an increase in the Contract Price, the cost of that Change Order shall be agreed to, in writing, in advance by Contractor and County and be subject to the monetary limitations set forth in Public Contract Code Section 20137. In the event that Contractor proceeds with any change in Work without a Change Order executed by the County or Construction Change Directive, Contractor waives any claim for additional compensation or time for that additional work.

17.1.4 Contractor understands, acknowledges, and agrees that the reason for County authorization is so that County may have an opportunity to analyze the Work and decide whether the County shall proceed with the Change Order or alter the Project so that a change in Work becomes unnecessary.

17.2 Architect Authority to Order Minor Changes

The Architect will have authority to order minor changes in the Work not involving any adjustment in the Contract Price, or an extension of the Contract Time, or a

change that is inconsistent with the intent of the Contract Documents. These changes shall be effected by written Change Order, Construction Change Directive, or by Architect's response(s) to RFI(s).

17.3 Change Orders

17.3.1 A Change Order is a written instrument prepared and issued by the County and/or the Architect and signed by the County (as authorized by the County's Board of Supervisors), the Contractor, and the Architect, stating their agreement regarding all of the following:

17.3.1.1 A description of a change in the Work;

17.3.1.2 The amount of the adjustment in the Contract Price, if any; and

17.3.1.3 The extent of the adjustment in the Contract Time, if any.

17.4 Construction Change Directives

17.4.1 A Construction Change Directive is a written order prepared and issued by the County, the Construction Manager, and/or the Architect and signed by the County and the Architect, directing a change in the Work. The County may as provided by law, by Construction Change Directive and without invalidating the Contract, order changes in the Work consisting of additions, deletions, or other revisions. Any dispute as to the sum of the Construction Change Directive or timing of payment shall be resolved pursuant to the Payment and Claims and Disputes provisions herein.

17.4.2 The County may issue a Construction Change Directive in the absence of agreement on the terms of a Change Order.

17.5 Force Account Directives

17.5.1 When work, for which a definite price has not been agreed upon in advance, is to be paid for on a force account basis, all direct costs necessarily incurred and paid by the Contractor for labor, material, and equipment used in the performance of that Work, shall be subject to the approval of the County and compensation will be determined as set forth herein.

17.5.2 The County will issue a Force Account Directive to proceed with the Work on a force account basis, and a not-to-exceed budget will be established by the County.

17.5.3 All requirements regarding direct cost for labor, labor burden, material, equipment, and markups on direct costs for overhead and profit described in this section shall apply to Force Account Directives. However, the County will only pay for actual costs verified in the field by the County or its authorized representative(s) on a daily basis.

17.5.4 The Contractor shall be responsible for all cost related to the administration of Force Account Directive. The markup for overhead and profit for Contractor modifications shall be full compensation to the Contractor to administer Force Account Directive.

17.5.5 The Contractor shall notify the County or its authorized representative(s) at least twenty-four (24) hours prior to proceeding with any of the force account work. Furthermore, the Contractor shall notify the County when it has consumed

eighty percent (80%) of the budget and shall not exceed the budget unless specifically authorized in writing by the County. The Contractor will not be compensated for force account work in the event that the Contractor fails to timely notify the County regarding the commencement of force account work, or exceeding the force account budget.

17.5.6 The Contractor shall diligently proceed with the work, and on a daily basis, submit a daily force account report on a form supplied by the County no later than 5:00 p.m. each day. The report shall contain a detailed itemization of the daily labor, material, and equipment used on the force account work only. The names of the individuals performing the force account work shall be included in the daily force account reports. The type and model of equipment shall be identified and listed. The County will review the information contained in the reports, and sign the reports no later than the next work day, and return a copy of the report to the Contractor for their records. The County will not sign, nor will the Contractor receive compensation for work the County cannot verify. The Contractor will provide a weekly force account summary indicating the status of each Force Account Directive in terms of percent complete of the not-to-exceed budget and the estimated percent complete of the work.

17.5.7 In the event the Contractor and the County reach a written agreement on a set cost for the work while the work is proceeding based on a Force Account Directive, the Contractor's signed daily force account reports shall be discontinued and all previously signed reports shall be invalid.

17.6 Price Request

17.6.1 Definition of Price Request

A Price Request ("PR") is a written request prepared by the Architect requesting the Contractor to submit to the County and the Architect an estimate of the effect of a proposed change in the Work on the Contract Price and the Contract Time.

17.6.2 Scope of Price Request

A Price Request shall contain adequate information, including any necessary Drawings and Specifications, to enable Contractor to provide the cost breakdowns required herein. The Contractor shall not be entitled to any additional compensation for preparing a response to a Price Request, whether ultimately accepted or not.

17.7 Proposed Change Order

17.7.1 Definition of Proposed Change Order

A Proposed Change Order ("PCO") is a written request prepared by the Contractor requesting that the County and the Architect issue a Change Order based upon a proposed change to the Work.

17.7.2 Changes in Contract Price

A PCO shall include breakdowns pursuant to the revisions herein to validate any change in Contract Price.

17.7.3 Changes in Time

A PCO shall also include any changes in time required to complete the Project. Any additional time requested shall not be the number of days to make the proposed change, but must be based upon the impact to the Construction Schedule as defined in the

Contract Documents. If Contractor fails to request a time extension in a PCO, then the Contractor is thereafter precluded from requesting time and/or claiming a delay.

17.7.4 Unknown and/or Unforeseen Conditions

If Contractor submits a PCO requesting an increase in Contract Price and/or Contract Time that is based at least partially on Contractor's assertion that Contractor has encountered unknown and/or unforeseen condition(s) on the Project, then Contractor shall base the PCO on provable information that, beyond a reasonable doubt and to the County's satisfaction, demonstrates that the unknown and/or unforeseen condition(s) were actually unknown and/or unforeseen and that the condition(s) were reasonably unknown and/or unforeseen. If not, the County shall deny the PCO and the Contractor shall complete the Project without any increase in Contract Price and/or Contract Time based on that PCO.

17.8 Format for Proposed Change

17.8.1 The following format shall be used as applicable by the County and the Contractor (e.g. Change Orders, PCO's) to communicate proposed additions and deductions to the Contract, supported by attached documentation. In no case shall the Contractor's total mark-up exceed 26.5%.

	SUBCONTRACTOR PERFORMED WORK	**AADD**	**DEDUCT**
a)	**Material** (attach itemized quantity and unit cost plus sales tax)		
b)	**Add Labor** (attach itemized hours and rates, fully encumbered)		
c)	**Add Equipment** (attach suppliers' invoice)		
d)	**Subtotal**		
e)	**Add Subcontractor's overhead and profit,** not to exceed ten percent (10%) of item (d)		
f)	**Subtotal**		
g)	**Add Contractor's overhead and profit**, not to exceed ten percent (10%) of Item (f)		
h)	**Subtotal**		
i)	**Add Bond and Insurance**, not to exceed one percent (1%) of Item (h)		
j)	**TOTAL**		
k)	**Time**	**_____ Days**	
	CONTRACTOR PERFORMED WORK	**ADD**	**DEDUCT**
a)	**Material** (attach itemized quantity and unit cost plus sales tax)		
b)	**Add Labor** (attach itemized hours and rates, fully encumbered)		

c)	**Add Equipment** (attach suppliers' invoice)		
d)	**Subtotal**		
e)	**Add Contractor's overhead and profit,** not to exceed ten percent (10%) of item (d)		
f)	**Subtotal**		
g)	**Add Bond and Insurance**, not to exceed one percent (1%) of Item (f)		
h)	**TOTAL**		
i)	**Time**	**_____ Days**	

17.9 Change Order Certification

17.9.1 All Change Orders and PCOs must include the following certification by the Contractor:

17.9.1.1 The undersigned Contractor approves the foregoing as to the changes, if any, and the Contract Price specified for each item and as to the extension of time allowed, if any, for completion of the entire Work as stated herein, and agrees to furnish all labor, materials, and service, and perform all work necessary to complete any additional work specified for the consideration stated herein. Submission of sums which have no basis in fact or which Contractor knows are false are at the sole risk of Contractor and may be a violation of the False Claims Act set forth under Government Code section 12650 et seq. It is understood that the changes herein to the Contract shall only be effective when approved by the Board of Supervisors.

17.9.1.2 It is expressly understood that the value of the extra Work or changes expressly includes any and all of the Contractor's costs and expenses, both direct and indirect, resulting from additional time required on the Project or resulting from delay to the Project. Any costs, expenses, damages, or time extensions not included are deemed waived.

17.10 Determination of Change Order Cost

The amount of the increase or decrease in the Contract Price from a Change Order, if any, shall be determined by one or more of the following ways as applicable to a specific situation and at the County's discretion:

17.10.1 County acceptance of a PCO;

17.10.2 By unit prices contained in Contractor's original bid;

17.10.3 By agreement between County and Contractor.

17.11 Allowable Costs

Allowable costs for any change order shall be limited to the following:

17.11.1 Costs of labor, including social security, Medicare, and unemployment insurance, fringe benefits required workers' compensation insurance.

17.11.2 Costs of first line supervision labor, including labor burden as described in paragraph 1. "First-Line Supervision" shall mean a working foreman or lead craft worker other than the project superintendent;

17.11.3 Actual costs of the project superintendent associated with any period of compensable delay caused by issuance of the change order. In the absence of a compensable delay, all of the project superintendent's time is considered to have been paid for as part of the overhead;

17.11.4 Actual costs of materials, including sales tax and delivery;

17.11.5 Rental costs of machinery and equipment, exclusive of small tools, whether rented from the Contractor or others. For Contractor and Subcontractor-owned equipment, payment will be made at rental rates listed for equipment in California Department of Transportation official equipment rental rate schedule. For rental equipment, payment will be made based on actual rental invoices. Rental rates paid shall be deemed to cover cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance and all incidentals;

17.11.6 Overhead and Profit as specified below. "Overhead" shall include the following:

17.11.6.1 Preparation of all paperwork related to changes in the Work, including field review, estimating and cost breakdown; coordination and supervision, both office and field, including the project superintendent; vehicles including has and maintenance; small tools, incidentals and consumables; engineering, detailing, and revisions to shop drawings and as-built drawings; general office expense; extended and unabsorbed home office overhead; warranty, all taxes; and all other expenses not specifically described in items 17.11.1 through 17.11.5.

17.11.6.2 The actual costs of insurance premiums required by this contract and associated with the change order work will be reimbursed by the County

17.11.7 Upon receipt of a PCO/Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Construction Manager within seven (7) calendar days of the Contractor's agreement or disagreement with the method, if any, provided in the PCO/Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

17.11.8 Failure to respond to and return a PCO/Change Directive to the County within (7) days indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

17.12 Deductive Change Orders

All deductive Change Order(s) must be prepared pursuant to the provisions herein. If Contractor offers a proposed amount for a deductive Change Order(s), Contractor shall include a minimum of five percent (5%) total profit and overhead to be

deducted with the amount of the work of the Change Order(s). If Subcontractor work is involved, Subcontractors shall also include a minimum of five percent (5%) profit and overhead to be deducted with the amount of its deducted work. Any deviation from this provision shall not be allowed.

17.13 Discounts, Rebates, and Refunds

For purposes of determining the cost, if any, of any change, addition, or omission to the Work hereunder, all trade discounts, rebates, refunds, and all returns from the sale of surplus materials and equipment shall accrue and be credited to the Contractor, and the Contractor shall make provisions so that such discounts, rebates, refunds, and returns may be secured, and the amount thereof shall be allowed as a reduction in the Contractor's cost in determining the actual cost of construction for purposes of any change, addition, or omission in the Work as provided herein.

17.14 Accounting Records

With respect to portions of the Work performed by Change Orders and Construction Change Directives, the Contractor shall keep and maintain cost-accounting records satisfactory to the County, which shall be available to the County on the same terms as any other books and records the Contractor is required to maintain under the Contract Documents.

17.15 Notice Required

If the Contractor desires to make a claim for an increase in the Contract Price or any extension of the Contract Time for completion, it shall notify the County pursuant to the provisions herein. No claim shall be considered unless made in accordance with this subparagraph. Contractor shall proceed to execute the Work, even though, the adjustment may not have been agreed upon. Any change in the Contract Price or extension of the Contract Time resulting from such claim shall be authorized by a Change Order.

17.16 Applicability to Subcontractors

Any requirements under this Article shall be equally applicable to Change Orders or Construction Change Directives issued to Subcontractors by the Contractor to the extent as required by the Contract Documents.

17.17 Alteration to Change Order Language

Contractor shall not alter Change Orders or reserve time in Change Orders. Contractor shall execute finalized Change Orders and proceed under the provisions herein with proper notice.

17.18 Failure of Contractor to Execute Change Order

Contractor shall be in default of the Contract if Contractor fails to execute a Change Order when the Contractor agrees with the addition and/or deletion of the Work in that Change Order.

18. REQUEST FOR INFORMATION

18.1 The Contractor shall coordinate the Work so that dimensions are verified, and clarifications that may affect the work are identified to allow for resolution without delaying the Work. The Contractor is responsible to submit a Request for Information as soon as the issue requiring clarification is identified. The Contractor shall be responsible

for any delay in the construction progress due to any untimely submission of a Request for Information for A/E's review. Non-receipt of a Request for Information, or proceeding with Work pertaining to the Request for Information shall be construed as relieving the County of any Claim for added cost or extension of time.

18.2 Reference Contract Documents

Any Request for Information shall reference all applicable Contract Document(s), including Specification section(s), detail(s), page number(s), drawing number(s), and sheet number(s), etc. The Contractor shall make suggestions and interpretations of the issue raised by each Request for Information. A Request for Information cannot modify the Contract Price, Contract Time, or the Contract Documents.

18.3 Contractor Responsible For Costs

Contractor shall be responsible for any costs incurred for professional services which County may deduct from any amounts owing to the Contractor, if a Request for Information requests an interpretation or decision of a matter where the information sought is equally available to the party making the request. County, at its sole discretion, shall deduct from and/or invoice Contractor for all the professional services arising herein.

19. PAYMENTS

19.1 Contract Price

The Contract Price is stated in the Agreement and, including authorized adjustments, is the total amount payable by the County to the Contractor for performance of the Work under the Contract Documents.

19.2 Applications for Progress Payments

19.2.1 Procedures for Applications for Progress Payments

19.2.1.1 Not before the fifth (5th) day of each calendar month during the progress of the Work, Contractor shall submit to the County and the Architect an itemized Application for Payment for operations completed in accordance with the Schedule of Values. Such application shall be notarized, if required and supported by the following or each portion thereof unless waived by the County in writing:

19.2.1.1.1 The amount paid to the date of the Application to the Contractor, to all its Subcontractors, and all others furnishing labor, material, or equipment for its Contract;

19.2.1.1.2 The amount being requested under the Application for Payment by the Contractor on its own behalf and separately stating the amount requested on behalf of each of the Subcontractors and all others furnishing labor, material, and equipment under the Contract;

19.2.1.1.3 The balance that will be due to each of such entities after said payment is made;

19.2.1.1.4 A certification that the Record Drawings and annotated Specifications are current;

19.2.1.1.5 Itemized breakdown of work done for the purpose of requesting partial payment;

19.2.1.1.6 An updated and acceptable construction schedule in conformance with Section 10.1 above;

19.2.1.1.7 The additions to and subtractions from the Contract Price and Contract Time;

19.2.1.1.8 A total of the retentions held;

19.2.1.1.9 Material invoices, evidence of equipment purchases, rentals, and other support and details of cost as the County may require from time to time;

19.2.1.1.10 The percentage of completion of the Contractor's Work by line item;

19.2.1.1.11 Schedule of Values updated from the preceding Application for Payment;

19.2.1.1.12 A duly completed and executed conditional waiver and release upon progress payment compliant with Civil Code Section 3262 from the Contractor and each subcontractor of any tier and supplier to be paid from the current progress payment;

19.2.1.1.13 A duly completed and executed unconditional waiver and release upon progress payment compliant with Civil Code Section 3262 from the Contractor and each subcontractor of any tier and supplier that was paid from the previous progress payment; and

19.2.1.1.14 A certification by the Contractor of the following:

> The Contractor warrants title to all Work performed as of the date of this payment application. The Contractor further warrants that all Work performed as of the date of this payment application is free and clear of liens, claims, security interests, or encumbrances in favor of the Contractor, Subcontractors, material and equipment suppliers, workers, or other persons or entities making a claim by reason of having provided labor, materials, and equipment relating to the Work, except those of which the County has been informed.

19.2.2 The Contractor shall be subject to the False Claims Act set forth under Government Code Section 12650 et seq., for information provided with any Application for Progress Payment.

19.2.3 Prerequisites for Progress Payments

19.2.3.1 First Payment Request: The following items, if applicable, must be completed before the County will accept and/or process the Contractor's first payment request:

19.2.3.1.1 Installation of the Project sign;

19.2.3.1.2 Installation of field office;

19.2.3.1.3 Installation of temporary facilities and fencing;

19.2.3.1.4 Schedule of Values;

19.2.3.1.5 Contractor's Construction Schedule in conformance with Section 10.1.1.1 above;

19.2.3.1.6 Schedule of unit prices, if applicable;

19.2.3.1.7 Submittal Schedule;

19.2.3.1.8 Receipt by Architect of all submittals due as of the date of the payment application;

19.2.3.1.9 Copies of necessary permits;

19.2.3.1.10 Copies of authorizations and licenses from governing authorities;

19.2.3.1.11 Initial progress report;

19.2.3.1.12 Surveyor qualifications;

19.2.3.1.13 Written acceptance of County's survey of rough grading, if applicable;

19.2.3.1.14 List of all Subcontractors, with names, license numbers, telephone numbers, and Scope of Work;

19.2.3.1.15 All bonds and insurance endorsements;

19.2.3.1.16 Resumes of Contractor's project manager, and if applicable, job site secretary, record documents recorder, and job site superintendent; and

19.2.3.1.17 Safety plan.

19.2.3.2 Second Payment Request. The County will not process the second payment request until and unless all submittals and Shop Drawings have been accepted for review by the Architect, and Contractor's Schedule has been accepted as in compliance with Section 10.1.1.1 above.

19.2.3.3 No Waiver of Criteria. Any payments made to Contractor where criteria set forth herein have not been met shall not constitute a waiver of said criteria by County. Instead, such payment shall be construed as a good faith effort by County to resolve differences so Contractor may pay its Subcontractors and suppliers. Contractor agrees that failure to submit such items may constitute a breach of contract by Contractor and may subject Contractor to termination.

19.3 Progress Payments

19.3.1 County's Approval of Application for Payment

19.3.1.1 Upon receipt of an Application for Payment, the County shall act in accordance with both of the following:

19.3.1.1.1 Each Application for Payment shall be reviewed by the County as soon as practicable after receipt for the purpose of determining that the Application for Payment is a proper Application for Payment.

19.3.1.1.2 Any Application for Payment determined not to be a proper Application for Payment suitable for payment shall be returned to the Contractor as soon as practicable, but not later than seven (7) calendar days, after receipt. An Application for Payment returned pursuant to this paragraph shall be accompanied by a document setting forth in writing, including by e-mail, the reasons why the Application for Payment is not proper. The number of days available to the County to make a payment without incurring interest pursuant to this section shall be reduced by the number of days by which the County exceeds this seven-day return requirement.

19.3.1.1.3 An Application for Payment shall be considered properly executed if funds are available for payment of the Application for Payment, and payment is not delayed due to an audit inquiry by the financial officer of the County.

19.3.1.2 The County's review of the Contractor's Application for Payment will be based on the County's and the Architect's observations at the Site and the data comprising the Application for Payment that the Work has progressed to the point indicated and that, to the best of the County's and the Architect's knowledge, information, and belief, the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to:

19.3.1.2.1 Observation of the Work for general conformance with the Contract Documents,

19.3.1.2.2 Results of subsequent tests and inspections,

19.3.1.2.3 Minor deviations from the Contract Documents correctable prior to completion, and

19.3.1.2.4 Specific qualifications expressed by the Architect.

19.3.1.3 County's approval of the certified Application for Payment shall be based on Contractor complying with all requirements for a fully complete and valid certified Application for Payment.

19.3.2 Payments to Contractor

19.3.2.1 Within thirty (30) days after approval of the Application for Payment, Contractor shall be paid a sum equal to ninety percent (90%) of the value of the Work performed (as verified by Architect and certified by Contractor) up to the last day of the previous month, less the aggregate of previous payments and amount to be withheld. The value of the Work completed shall be Contractor's best estimate. No inaccuracy or error in said estimate shall operate to release the Contractor, or any Surety upon any bond, from damages arising from such Work, or from the County's right to enforce each and every

provision of this Contract, and the County shall have the right subsequently to correct any error made in any estimate for payment.

19.3.2.2 The Contractor shall not be entitled to have any payment requests processed, or be entitled to have any payment made for Work performed, so long as any lawful or proper direction given by the County concerning the Work or any portion thereof, remains incomplete.

19.3.2.3 If the County fails to make any progress payment within thirty (30) days after receipt of an undisputed and properly submitted Application for Payment by the Contractor, the County shall pay interest to the Contractor equivalent to the legal rate set forth in subdivision (a) of Section 685.010 of the Code of Civil Procedure.

19.3.3 No Waiver

No payment by County hereunder shall be interpreted so as to imply that County has inspected, approved, or accepted any part of the Work. Notwithstanding any payment, the County may enforce each and every provision of this Contract. The County may correct or require correction of any error subsequent to any payment.

19.3.4 Removal of Liens

19.3.4.1 If a lien or a claim based on a stop notice of any nature should at any time be filed against the Work or any County property, by any entity that has supplied material or services at the request of the Contractor, Contractor and Contractor's Surety shall promptly, on demand by County and at Contractor's and Surety's own expense, take any and all action necessary to cause any such lien or a claim based on a stop notice to be released or discharged immediately therefrom.

19.3.4.2 If the Contractor fails to furnish to the County within ten (10) calendar days after demand by the County, satisfactory evidence that a lien or a claim based on a stop notice has been so released, discharged, or secured, the County may discharge such indebtedness and deduct the amount required therefor, together with any and all losses, costs, damages, and attorney's fees and expense incurred or suffered by County from any sum payable to Contractor under the Contract.

19.4 Decisions to Withhold Payment

19.4.1 Reasons to Withhold Payment

The County may withhold payment in whole, or in part, to the extent reasonably necessary to protect the County if, in the County's opinion, the representations to the County required herein cannot be made. The County may withhold payment, in whole, or in part, to such extent as may be necessary to protect the County from loss because of, but not limited to:

19.4.1.1 Defective Work not remedied within the time frames noted in Section 14 hereof of written notice to Contractor;

19.4.1.2 Stop Notices, or other liens served upon the County as a result of the Contract;

19.4.1.3 Liquidated damages assessed against the Contractor;

19.4.1.4 The cost of completion of the Contract, if there exists reasonable doubt that the Work can be completed for the unpaid balance of the Contract Price or by the completion date;

19.4.1.5 Damage to the County or other contractor(s);

19.4.1.6 Unsatisfactory prosecution of the Work by the Contractor;

19.4.1.7 Failure to store and properly secure materials;

19.4.1.8 Failure of the Contractor to submit, on a timely basis, proper, sufficient, and acceptable documentation required by the Contract Documents, including, without limitation, a Construction Schedule, Schedule of Submittals, Schedule of Values, Monthly Progress Schedules, Shop Drawings, Product Data and samples, Proposed product lists, executed Change Orders, and/or properly completed Elation updates;

19.4.1.9 Failure of the Contractor to maintain Record Drawings;

19.4.1.10 Erroneous estimates by the Contractor of the value of the Work performed, or other false statements in an Application for Payment;

19.4.1.11 Unauthorized deviations from the Contract Documents;

19.4.1.12 Failure of the Contractor to prosecute the Work in a timely manner in compliance with the Construction Schedule, established progress schedules, and/or completion dates;

19.4.1.13 Failure to properly pay prevailing wages as defined in Labor Code section 1720 et seq., and/or failure to comply with any other Labor Code requirements,

19.4.1.14 Failure to properly maintain or clean up the Site;

19.4.1.15 Payments to indemnify, defend, or hold harmless the County;

19.4.1.16 Any payments due to the County, including but not limited to payments for failed tests, utility changes or permits;

19.4.1.17 Failure to pay Subcontractor(s) or supplier(s) as required by law and by the Contract Documents;

19.4.1.18 Contractor is otherwise in breach, default, or in substantial violation of any provision of this Contract.

19.4.2 Reallocation of Withheld Amounts

19.4.2.1 County may, at its discretion, apply any withheld amount to pay outstanding claims or obligations as defined herein. In so doing, County shall make such payments on behalf of Contractor. If any payment is so made by County, then that amount shall be considered a payment made under Contract by County to Contractor and County

shall not be liable to Contractor for any payment made in good faith. These payments may be made without prior judicial determination of claim or obligation. County will render Contractor an accounting of funds disbursed on behalf of Contractor.

19.4.2.2 If Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents or fails to perform any provision thereof, County may, after FORTY-EIGHT (48) hours written notice to the Contractor and, without prejudice to any other remedy, make good such deficiencies. The County shall adjust the total Contract Price by reducing the amount thereof by the cost of making good such deficiencies. If County deems it inexpedient to correct Work that is damaged, defective, or not done in accordance with Contract provisions, an equitable reduction in the Contract Price (of at least one hundred twenty-five percent (125%) of the estimated reasonable value of the nonconforming Work) shall be made therefor.

19.4.3 Payment After Cure

When Contractor removes the grounds for declining approval, payment shall be made for amounts withheld because of them. No interest shall be paid on any retainage or amounts withheld due to the failure of the Contractor to perform in accordance with the terms and conditions of the Contract Documents.

19.5 Subcontractor Payments

19.5.1 Payments to Subcontractors

No later than ten (10) days after receipt, or pursuant to Business and Professions Code Section 7108.5 and Public Contract Code Section 7107, the Contractor shall pay to each Subcontractor, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to its Sub-subcontractors in a similar manner.

19.5.2 No Obligation of County for Subcontractor Payment

The County shall have no obligation to pay or to see to the payment of, money to a Subcontractor except as may otherwise be required by law.

19.5.3 Joint Checks

County shall have the right in its sole discretion if necessary for the protection of the County, to issue joint checks made payable to the Contractor and Subcontractors and material or equipment suppliers. The joint check payees shall be responsible for the allocation and disbursement of funds included as part of any such joint payment. In no event shall any joint check payment be construed to create any contract between the County and a Subcontractor of any tier, any obligation from the County to such Subcontractor, or rights in such Subcontractor against the County.

20. COMPLETION OF THE WORK

20.1 Completion

20.1.1 County will accept completion of the Contract and have the Notice of Completion recorded when the entire Work shall have been completed to the satisfaction of County.

20.1.2 The Work may only be accepted as complete by action of the County Board of Supervisors.

20.1.3 County, at its sole option, may accept completion of Contract and have the Notice of Completion recorded when the entire Work shall have been completed to the satisfaction of County, except for minor corrective items, as distinguished from incomplete items. If Contractor fails to complete all minor corrective items within thirty (30) days after the date of the County's acceptance of completion, County shall withhold from the final payment one hundred fifty percent (150%) of an estimate of the amount sufficient to complete the corrective items, as determined by County, until the item(s) are completed.

20.1.4 At the end of the thirty-five (35) day period, if there are any items remaining to be corrected, County may elect to proceed as provided herein related to adjustments to Contract Price, and/or County's right to perform the Work of the Contractor.

20.2 Close-Out Procedures

20.2.1 Punch List

The Contractor shall notify the Architect when Contractor considers the Work complete. Upon notification, Architect will prepare a list of minor items to be completed or corrected ("Punch List"). The Contractor and/or its Subcontractors shall proceed promptly to complete and correct items on the Punch List. Failure to include an item on Punch List does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

20.2.2 Close-Out Requirements

20.2.2.1 Utility Connections

Buildings shall be connected to water, gas, sewer, and electric services, complete and ready for use. Service connections shall be made, and existing services reconnected.

20.2.2.2 Record Drawings

20.2.2.2.1 Contractor shall provide exact "as-built" Record Drawings of the Work upon completion of the Project as indicated in the Specifications.

20.2.2.2.2 Contractor is liable and responsible for any and all inaccuracies in as-built Record Drawings, even if inaccuracies become evident at a future date.

20.2.2.2.3 Upon completion of the Work and as a condition precedent to approval of final payment, Contractor shall obtain the Architect's approval of the corrected prints and employ a competent draftsman to transfer the "as-built" information to the most current version of Autocad

that is, at that time, currently utilized for plan check submission by either the County, the Construction Manager and/or the Architect, and submit electronic files. When completed, Contractor shall deliver corrected electronic files acceptable to County with Autocad file to the County.

20.2.2.2.4 Maintenance Manuals: Contractor shall prepare all operation and maintenance manuals and date as indicated in the Specifications.

20.3 Final Inspection

20.3.1 Contractor shall comply with Punch List procedures as provided herein, and maintain the presence of a Project Superintendent and Project Manager until the Punch List is complete to ensure proper and timely completion of the Punch List. Under no circumstances shall Contractor demobilize its forces prior to completion of the Punch List. Upon receipt of Contractor's written notice that all of the Punch List items have been fully completed and the Work is ready for final inspection and acceptance, Architect and Construction Manager will inspect the Work and shall submit to Contractor and County a final inspection report noting the Work, if any, required in order to complete in accordance with the Contract Documents. Absent unusual circumstances, this report shall consist of the Punch List items not yet satisfactorily completed.

20.3.2 Upon Contractor's completion of all items on the Punch List and any other uncompleted portions of the Work, the Contractor shall notify the County and Architect, who shall again inspect such Work. If the Architect finds the Work complete and acceptable under the Contract Documents, the Architect will notify Contractor, who shall then jointly submit to the Architect and the County its final Application for Payment.

20.3.3 Final Inspection Requirements

Before calling for final inspection, Contractor shall determine that the following have been performed:

20.3.3.1 The Work has been completed.

20.3.3.2 All life-safety items are completed and in working order.

20.3.3.3 Mechanical and electrical Work are complete and tested, fixtures are in place, connected, and ready for tryout.

20.3.3.4 Electrical circuits scheduled in panels and disconnect switches labeled.

20.3.3.5 Painting and special finishes complete.

20.3.3.6 Doors complete with hardware, cleaned of protective film, relieved of sticking or binding, and in working order.

20.3.3.7 Tops and bottoms of doors sealed.

20.3.3.8 Floors waxed and polished as specified.

20.3.3.9 Broken glass replaced and glass cleaned.

20.3.3.10 Grounds cleared of Contractor's equipment, raked clean of debris, and trash removed from Site.

20.3.3.11 Work cleaned, free of stains, scratches, and other foreign matter, of damaged and broken material replaced.

20.3.3.12 Finished and decorative work shall have marks, dirt, and superfluous labels removed.

20.3.3.13 Final cleanup, as provided herein.

20.4 Costs of Multiple Inspections

More than two (2) requests of the County to make a final inspection shall be considered an additional service of County, Architect, and/or Construction Manager, and all subsequent costs will be invoiced to Contractor and if funds are available, withheld from remaining payments.

20.5 Partial Occupancy or Use Prior to Completion

20.5.1 County's Rights

The County may occupy or use any completed or partially completed portion of the Work at any stage. The County and the Contractor shall agree in writing to the responsibilities assigned to each of them for payments, security, maintenance, heat, utilities, damage to the Work, insurance, the period for correction of the Work, and the commencement of warranties required by the Contract Documents. Any dispute as to responsibilities shall be resolved pursuant to the Claims and Disputes provisions herein, with the added provision that during the dispute process, the County shall have the right to occupy or use any portion of the Work that it needs or desires to use.

20.5.2 Inspection Prior to Occupancy or Use

Immediately prior to partial occupancy or use, the County, the Contractor, and the Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

20.5.3 No Waiver

Unless otherwise agreed upon, partial or entire occupancy or use of a portion or portions of the Work shall not constitute beneficial occupancy or acceptance of the Work not complying with the requirements of the Contract Documents.

21. FINAL PAYMENT AND RETENTION

21.1 Final Payment

Upon receipt and approval of a valid and final Application for Payment, the Architect will issue a final Certificate of Payment. The County shall thereupon jointly inspect the Work and either accept the Work as complete or notify the Architect and the Contractor in writing of reasons why the Work is not complete. Upon acceptance of the Work of the Contractor as fully complete (that, absent unusual circumstances, will occur when the Punch List items have been satisfactorily completed), the County shall record a Notice of Completion with the County Recorder, and the Contractor shall, upon receipt of final payment from the County, pay the amount due Subcontractors.

21.2 Prerequisites for Final Payment

The following conditions must be fulfilled prior to Final Payment:

21.2.1 A full and final waiver or release of all Stop Notices in connection with the Work shall be submitted by Contractor, including a release of Stop Notice in recordable form, together with (to the extent permitted by law) a copy of the full and final release of all Stop Notice rights.

21.2.1.1 A duly completed and executed conditional waiver and release upon final payment compliant with Civil Code section 3262 from the Contractor and each subcontractor of any tier and supplier to be paid from the current progress payment;

21.2.1.2 A duly completed and executed unconditional waiver and release upon progress payment compliant with Civil Code section 3262 from the Contractor and each subcontractor of any tier and supplier that was paid from the previous progress payment; and

21.2.1.3 The Contractor shall have made all corrections to the Work that are required to remedy any defects therein, to obtain compliance with the Contract Documents or any requirements of applicable codes and ordinances, or to fulfill any of the orders or directions of County required under the Contract Documents.

21.2.2 Each Subcontractor shall have delivered to the Contractor all written guarantees, warranties, applications, and bonds required by the Contract Documents for its portion of the Work.

21.2.3 Contractor must have completed all requirements set forth under "Close-Out Procedures," Including, without limitation, an approved set of complete "as-built" Record Drawings.

21.2.4 Architect shall have issued its written approval that final payment can be made.

21.2.5 The Contractor shall have delivered to the County all manuals and materials required by the Contract Documents.

21.2.6 The Contractor shall have completed final clean up as provided herein.

21.3 Retention

21.3.1 The retention, less any amounts disputed by the County or that the County has the right to withhold pursuant to provisions herein, shall be paid:

21.3.1.1 After approval of the County by the Architect's Certificate of Payment,

21.3.1.2 After the satisfaction of the conditions set forth herein, and

21.3.1.3 After thirty-five (35) days after the recording of the Notice of Completion by County.

21.3.2 No interest shall be paid on any retention, or on any amounts withheld due to a failure of the Contractor to perform, in accordance with the terms and

conditions of the Contract Documents, except as provided to the contrary in any Escrow Agreement between the County and the Contractor pursuant to Public Contract Code section 22300.

21.4 Substitution of Securities

The County will permit the substitution of securities in accordance with the provisions of Public Contract Code section 22300.

22. UNCOVERING OF WORK

If a portion of the Work is covered without Architect approval or not in compliance with the Contract Documents, it must, if required in writing, including by email, by the County or the Architect, be uncovered for the Architect's observation and be replaced at the Contractor's expense without change in the Contract Price or Contract Time.

If a portion of the Work has been covered, which the Project Inspector or the Architect has not specifically requested to observe prior to its being covered, the County, Project Inspector, or the Architect may request to see that Work, and it shall be uncovered by the Contractor. If that Work is in accordance with the Contract Documents, costs of uncover and replacement shall, by appropriate Change Order, be charged to the County. If that Work is not in accordance with Contract Documents, the Contractor shall pay these costs unless the condition was caused by the County or a separate contractor, in which event the County shall be responsible for payment of such costs to the Contractor.

23. NONCONFORMING WORK, CORRECTION OF WORK AND COUNTY'S RIGHT TO PERFORM WORK

23.1 Nonconforming Work

23.1.1 Contractor shall promptly remove from Premises all Work identified by County as failing to conform to the Contract Documents whether incorporated or not. Contractor shall promptly replace and re-execute its own Work to comply with the Contract Documents without additional expense to the County and shall bear the expense of making good all work of other contractors destroyed or damaged by any removal or replacement pursuant hereto and/or any delays to the County or other Contractors caused thereby.

23.1.2 If Contractor does not remove Work that County has identified as failing to conform to the Contract Documents within a reasonable time, not to exceed FORTY-EIGHT (48) hours, County may remove it and may store any material at Contractor's expense. If Contractor does not pay expense(s) of that removal within ten (10) days' time thereafter, County may, upon ten (10) days' written notice, sell any material at auction or at private sale and shall deduct all costs and expenses incurred by the County and/or County may withhold those amounts from payment(s) to Contractor.

23.2 Correction of Work

23.2.1 Correction of Rejected Work

Pursuant to the notice provisions herein, the Contractor shall promptly correct the Work rejected by the County or the Architect as failing to conform to the requirements of the Contract Documents, whether observed before or after Completion and whether or not fabricated, installed, or completed. The Contractor shall bear costs of correcting the

rejected Work, including additional testing, inspections, and compensation for the Architect's services and expenses made necessary thereby.

23.2.2 Warranty Corrections

If, within the warranty period specified in 00 65 36 Warranty Form, after the date of Completion of the Work or a designated portion thereof, or after the date of commencement of warranties established hereunder, or by the terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the County to do so. This period of two (2) years shall be extended with respect to portions of the Work first performed after Completion by the period of time between Completion and the actual performance of the Work. This obligation hereunder shall survive acceptance of the Work under the Contract and termination of the Contract. The County shall give such notice promptly after discovery of the condition.

23.3 County's Right to Perform Work

23.3.1 If the Contractor should neglect to prosecute the Work properly or fail to perform any provisions of this contract, the County, after FORTY-EIGHT (48) hours written notice to the Contractor, may, without prejudice to any other remedy it may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor.

23.3.2 If it is found at any time, before or after completion of the Work, that Contractor has varied from the Drawings and/or Specifications, including, but not limited to, variation in material, quality, form, or finish, or in the amount or value of the materials and labor used, County may require at its option:

23.3.2.1 That all such improper Work be removed, remade or replaced, and all work disturbed by these changes be made good by Contractor at no additional cost to the County;

23.3.2.2 That the County deduct from any amount due Contractor the sum of money equivalent to the difference in value between the work performed and that called for by the Drawings and Specifications; or

23.3.2.3 That the County exercise any other remedy it may have at law or under the Contract Documents, including but not limited to the County hiring its own forces or another contractor to replace the Contractor's nonconforming Work, in which case the County shall either issue a deductive Change Order, a Construction Change Directive or invoice the Contractor for the cost of that work. Contractor shall pay any invoices within thirty (30) days of receipt of same or County may withhold those amounts from payment(s) to Contractor.

24. TERMINATION AND SUSPENSION

24.1 County's Right to Terminate Contractor for Cause

24.1.1 Grounds for Termination.

The County, in its sole discretion, may terminate the Contract and/or terminate the Contractor's right to perform the work of the Contract based upon the following:

24.1.1.1 Contractor refuses or fails to execute the Work or any separable part thereof with sufficient diligence as will ensure its completion within the time specified or any extension thereof, or

24.1.1.2 Contractor fails to complete said Work within the time specified or any extension thereof, or

24.1.1.3 Contractor persistently fails or refused to perform Work or provide material of sufficient quality as to be in compliance with Contract Documents; or

24.1.1.4 Contractor files a petition for relief as a debtor, or a petition is filed against the Contractor without its consent, and the petition not dismissed within sixty (60) days; or

24.1.1.5 Contractor makes a general assignment for the benefit of its creditors, or a receiver is appointed on account of its insolvency; or

24.1.1.6 Contractor persistently or repeatedly refuses or fails, except in cases for which extension of time is provided, to supply enough properly skilled workers or proper materials to complete the Work in the time specified; or

24.1.1.7 Contractor fails to make prompt payment to Subcontractors, or for material, or for labor; or

24.1.1.8 Contractor persistently disregards laws or ordinances, or instructions of County; or

24.1.1.9 Contractor fails to supply labor, including that of Subcontractors, that can work in harmony with all other elements of labor employed or to be employed on the Work; or

24.1.1.10 Contractor or its Subcontractor(s) is/are otherwise in breach, default, or in substantial violation of any provision of this Contract.

24.1.2 Notification of Termination

24.1.2.1 Upon the occurrence of County's sole determination of any of the above conditions, County may, without prejudice to any other right or remedy, serve written notice upon Contractor and its Surety of County's termination of this Contract and/or the Contractor's right to perform the work of the Contract. This notice will contain the reasons for termination. Unless, within three (3) days after the service of the notice, any and all condition(s) shall cease, and any and all violation(s) shall cease, or arrangement satisfactory to County for the correction of the condition(s) and/or violation(s) be made, this Contract shall cease and terminate. Upon Determination, Contractor

shall not be entitled to receive any further payment until the entire Work is finished.

24.1.2.2 Upon Termination, County may immediately serve written notice of tender upon Surety whereby Surety shall have the right to take over and perform this Contract only if Surety:

24.1.2.2.1 Within three (3) days after service upon it of the notice of tender, gives County written notice of Surety's intention to take over and perform this Contract; and

24.1.2.2.2 Commences performance of this Contract within (three (3) days from the date of serving of its notice to County.

24.1.2.3 If Surety fails to notify County or begin performance as indicated herein, County may take over the Work and execute the Work to completion by any method it may deem advisable at the expense of Contractor and/or its Surety. Contractor and/or its Surety shall be liable to County for any excess cost or other damages the County incurs thereby. Time is of the essence in this Contract. If the County takes over the Work as herein provided, County may, without liability for so doing, take possession of and utilize in completing the Work such materials, appliances, plan, and other property belonging to Contractor as may be on the Site of the Work, in bonded storage, or previously paid for.

24.1.3 Effect of Termination

24.1.3.1 Contractor shall, only if ordered to do so by the County, immediately remove from the Site all or any materials and personal property belonging to Contractor that have not been incorporated in the construction of the Work, or which are not in place in the Work. The County retains the right, but not the obligation, to keep and use any materials and personal property belonging to Contractor that have not been incorporated in the construction of the Work, or which are not in place in the Work. The Contractor and its Surety shall be liable upon the performance bond for all damages caused the County by reason of the Contractor's failure to complete the Contract.

24.1.3.2 In the event that the County shall perform any portion of, or the whole of the Work, pursuant to the provisions of the General Conditions, the County shall not be liable nor account to the Contractor in any way for the time within which, or the manner in which, the Work is performed by the County or for any changes the County may make in the Work or for the money expended by the County in satisfying claims and/or suits and/or other obligations in connection with the Work.

24.1.3.3 In the event, that the Contract is terminated for any reason, no allowances or compensation will be granted for the loss of any anticipated profit by the Contractor.

24.1.3.4 If the expense to the County to finish the Work exceeds the unpaid Contract Price, Contractor and Surety shall pay the difference to County within twenty-one (21) days of County's request.

24.1.3.5 The County shall have the right (but shall have no obligation) to assume and/or assign to a general contractor or construction manager or other third party who is qualified and has sufficient resources to complete the Work, the rights of the Contractor under its subcontracts with any or all Subcontractors. In the event of an assumption or assignment by the County, no Subcontractor shall have any claim against the County or third party for Work performed by Subcontractor or other matters arising prior to termination of the Contract. The County or any third party, as the case may be, shall be liable only for obligations to the Subcontractor arising after assumption or assignment. Should the County so elect, the Contractor shall execute and deliver all documents and take all steps, including the legal assignment of its contractual rights, as the County may require, for the purpose of fully vesting in the County the rights and benefits of it Subcontractor under Subcontracts or other obligations or commitments. All payments due the Contractor hereunder shall be subject to a right of offset by the County for expenses and damages suffered by the County as a result of any default, acts, or omissions of the Contractor. Contractor must include this assignment provision in all of its contracts with its Subcontractors.

24.1.3.6 The foregoing provisions are in addition to and not in limitation of any other rights or remedies available to County.

24.2 Termination of Contractor for Convenience

24.2.1 County in its sole discretion may terminate the Contract upon three (3) days written notice to the Contractor. Under a termination for convenience, the County retains the right to all the options available to the County if there is a termination for cause. In case of a termination for convenience, the Contractor shall have no claims against the County except:

24.2.1.1 The actual cost of labor, materials, and services performed that is unpaid and can be documented through timesheets, invoices, receipts, or otherwise, and

24.2.1.2 Five percent (5%) of the total cost of work performed as of the date of termination, or five percent (5%) of the value of the Work yet to be performed, whichever is less. This five percent (5%) amount shall be full compensation for all Contractor's and its Subcontractor(s)' mobilization and/or demobilization costs and any anticipated loss profits resulting from termination of the Contractor for convenience.

24.3 Emergency Termination of Public Contracts Act of 1949

24.3.1 This Contract is subject to termination as provided by sections 4410 and 4411 of the Government Code of the State of California, being a portion of the Emergency Termination of Public Contracts Act of 1949.

24.3.1.1 Section 4410 of the Government Code states:

In the event a national emergency occurs, and public work, being performed by contract, is stopped, directly or indirectly, because of the freezing or diversion of materials, equipment or labor, as the result of an order or a proclamation of the President of the United States, or of an order of any federal authority, and the circumstances or conditions are such that it is impracticable within a reasonable time to proceed with a substantial portion of the work, then the public agency and the contractor may, by written agreement, terminate said contract.

24.3.1.2 Section 4411 of the Government Code states:

Such an agreement shall include the terms and conditions of the termination of the contract and provision for the payment of compensation or money, if any, which either party shall pay to the other or any other person, under the facts and circumstances in the case.

24.3.1.3 Compensation to the Contractor shall be determined at the sole discretion of County on the basis of the reasonable value of the Work done, including preparatory work. As an exception to the foregoing and at the County's discretion, in the case of any fully completed separate item or portion of the Work for which there is a separate previously submitted unit price or item on the accepted schedule of values, that price shall control. The County, at its sole discretion, may adopt the Contract Price as the reasonable value of the work done or any portion thereof.

25. CLAIMS AND DISPUTES

25.1 Performance During Claim Process

The Contractor shall continue to perform its Work under the Contract and shall not cause a delay in the Work during any dispute, claims definition, negotiation, mediation, or arbitration proceeding, except by written agreement by the County.

25.2 Definition of Claim

25.2.1 For purposes of this section, a “Claim” means a separate demand by the Contractor for:

25.2.1.1 A time extension,

25.2.1.2 Payment of money or damages arising from Work done by or on behalf of the Contractor pursuant to the Contract and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to, or

25.2.1.3 Payment of money that the County disputes is owing.

25.3 Claim Presentations

25.3.1 The attention of the Contractor is drawn to Government Code Section 12650, et seq. regarding penalties for false claims.

25.3.2 Contractor shall file with the County any written Claim, including the documents necessary to substantiate it, on or before the day of final payment on the Contract.

25.3.3 The Contractor shall not cause a delay in the Work during any dispute, claims definition, negotiation, mediation, or arbitration proceeding, except by written agreement by the County.

25.3.4 The Contractor shall bind all its Subcontractors, material persons, and suppliers to the provisions of this section on mediation and arbitration and will hold the County harmless against disputes and claims by Subcontractors, material persons, or suppliers.

25.4 Claim Resolution

25.4.1 In the event of a dispute between the parties as to performance of the Work, the interpretation of this Contract, or payment or nonpayment for Work performed or not performed, the parties shall attempt to resolve the dispute by those procedures set forth in Public Contract Code Section 9204, if applicable. Pending resolution of the dispute, if the dispute is not resolved, Contractor agrees it will neither rescind the Contract nor stop the progress of the Work, but will allow determination by a court of the State of California having competent jurisdiction of the dispute, after the Project has been completed, and not before.

25.4.2 For all Claims which arise between a Contractor and a local agency, the procedure set forth in Public Contract Code Section 9204 shall apply:

25.4.2.1 The County shall respond in writing within forty-five (45) days of receipt of the Claim identifying what portion of the Claim is disputed and what portion is undisputed.

25.4.2.1.1 Upon receipt of a Claim, County and Contractor may, by mutual agreement, extend the time period for County to respond.

25.4.2.1.2 Any payment due on an undisputed portion of the Claim shall be processed and made within sixty (60) days after the County issues its written response to the Claim.

25.4.3 If Contractor disputes County's written response, or if County fails to respond to a Claim issued pursuant to this Section 25 within the time prescribed, Contractor may demand in writing an informal conference to meet and confer for settlement of the issues in dispute.

25.4.3.1 Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, County

shall schedule a meet and confer conference within thirty (30) days for settlement of the dispute.

25.4.4 Within ten (10) business days following the conclusion of the meet and confer conference, if the Claim or any portion of the Claim remains in dispute, the County shall provide Contractor a written statement identifying the portion of the Claim that remains in dispute and the portion that is undisputed.

25.4.4.1 Any payment due on an undisputed portion of the Claim shall be processed and made within sixty (60) days after the County issues its written statement.

25.4.5 Any disputed portion of the Claim, as identified by the statement referenced in Section 25.4.4 shall be submitted to nonbinding mediation, with the County and Contractor sharing the associated costs equally.

25.4.5.1 County and Contractor shall mutually agree to a mediator within ten (10) business days after the disputed portion of the claim has been identified in writing.

25.4.5.2 If County and Contractor cannot agree to a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the claim.

25.4.5.3 County and Contractor shall each bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator.

25.4.5.4 If mediation is unsuccessful, the parts of the claim remaining in dispute shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of the Title 3 of Part 3 of the Code of Civil Procedure, notwithstanding Section 1141.11 of that code. The Civil Discovery Act of 1986, (Article 3 (commencing with Section 2016) of Chapter 3 of Title 3 of part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration.

25.4.6 The County shall not fail to pay money as to any portion of a claim which is undisputed except as otherwise provided in the Contract Documents. Unpaid claim amounts not paid in a timely manner will accrue interest at seven percent (7%) per annum. In any suit filed pursuant to this section, the County shall pay interest at the legal rate on any arbitration award or judgment. Interest shall begin to accrue on the date the suit is filed in a court of law.

26. LABOR, WAGE & HOUR, APPRENTICE, AND RELATED PROVISIONS

26.1 Wage Rates, Travel, and Subsistence – (For Projects over $1M see also PROJECT STABILIZATION/ COMMUNITY BENEFITS AGREEMENT of the COUNTY OF ALAMEDA Document 00 73 49).

26.1.1 Pursuant to the provisions of Article 2 (commencing with Section 1770), chapter 1, part 7, division 2, of the Labor Code of California, the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work in the locality in which this public work is to be performed for each craft, classification, or type of worker needed to execute this Contract is on file at the County's principal office and copies will be made available to any interested party on request. Contractor shall obtain and post a copy of these wage rates at the job site.

26.1.2 Holiday and overtime work, when permitted by law, shall be paid for at a rate of at least one and one-half times the above specified rate of per diem wages, unless otherwise specified. The holidays upon which those rates shall be paid need not be specified by the County but shall be all holidays recognized in the applicable collective bargaining agreement. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code.

26.1.3 Contractor shall pay and shall cause to be paid each worker engaged in Work on the Project not less than the general prevailing rate of per diem wages determined by the Director of the Department of Industrial Relations ("DIR") ("Director"), regardless of any contractual relationship which may be alleged to exist between Contractor or any Subcontractor and such workers.

26.1.4 Contractor shall pay and shall cause to be paid to each worker needed to execute the Work on the Project travel and subsistence payments, as such travel and subsistence payments are defined in the applicable Collective Bargaining Agreements filed with the Department of Industrial Relations in accordance with Labor Code Section 1773 et seq.

26.1.5 If during the period this bid is required to remain open, the Director determines that there has been a change in any prevailing rate of per diem wages in the locality in which the Work under the Contract is to be performed, such change shall not alter the wage rates in the Notice to Bidders or the Contract subsequently awarded.

26.1.6 Pursuant to Labor Code Section 1775, Contractor shall, as a penalty to County, forfeit the statutory amount for each calendar day, or portion thereof, for each worker paid less than the prevailing rates, determined by the County and/or the Director, for the work or craft in which that worker is employed for any public work done under Contract by Contractor or by any Subcontractor under it. The difference between such prevailing wage rates and the amount paid to each worker for each calendar day or portion thereof for which each worker was paid less than the prevailing wage rate, shall be paid to each worker by Contractor.

26.1.7 Any worker employed to perform Work on the Project, which Work is not covered by any classification listed in the general prevailing wage rate of per diem wages determined by the Director, shall be paid not less than the minimum rate of wages specified therein for the classification which most nearly corresponds to Work to be performed by him, and such minimum wage rate shall be retroactive to time of initial employment of such person in such classification.

26.1.8 Pursuant to Labor Code section 1773.1, per diem wages are deemed to include employer payments for health and welfare, pension, vacation, travel time, subsistence pay, and apprenticeship or other training programs authorized by section 3093, and similar purposes.

26.1.9 Contractor shall post at appropriate conspicuous points on the Site of Project, a schedule showing all determined minimum wage rates and all authorized deductions if any, from unpaid wages, actually earned. In addition, Contractor shall post a sign-in log for all workers and visitors to the Site, a list of all subcontractors of any tier on the Site, and the required Equal Employment Opportunity poster(s).

26.1.10 Contractor stipulates that it shall comply with all requirements of PROJECT STABILIZATION/COMMUNITY BENEFITS AGREEMENT (**For projects over $1M**) of the COUNTY OF ALAMEDA, and shall pay to persons performing labor in and about the Work provided for in the Contract an amount equal to or more than the following:

26.1.10.1 Wage rate and fringe benefit payments and classification for that person's corresponding labor classification as required by the Department of Industrial Relations;

26.1.10.2 Wage rate and fringe benefit payments and classification for that person's corresponding labor classification as required under the PROJECT STABILIZATION/COMMUNITY BENEFITS AGREEMENT of the COUNTY OF ALAMEDA (**For projects over $1M)** and California Labor Code.

26.1.11 If there are conflicts between the Wage rate and fringe benefit payments and classification between the Department of Industrial Relations and the PROJECT STABILIZATION/COMMUNITY BENEFITS AGREEMENT of the COUNTY OF ALAMEDA (**For projects over $1M)**, Contractor shall pay the higher wage rate and fringe benefits.

26.2 Hours of Work

26.2.1 As provided in Article 3 (commencing with Section 1810), chapter 1, part 7, division 2, of the Labor Code, eight (8) hours of labor shall constitute a legal days work. The time of service of any worker employed at any time by Contractor or by any Subcontractor on any subcontract under this Contract upon the Work or upon any part of the Work contemplated by this Contract shall be limited and restricted by Contractor to eight (8) hours per day, and forty (40) hours during any one week, except as hereinafter provided. Notwithstanding the provisions hereinabove set forth, Work performed by employees of Contractor in excess of eight (8) hours per day and forty (40) hours during any one week, shall be permitted upon this public work upon compensation for all hours worked in excess of eight (8) hours per day at not less than one and one-half times the basic rate of pay.

26.2.2 Contractor shall keep and shall cause each Subcontractor to keep an accurate record showing the name of and actual hours worked each calendar day and each calendar week by each worker employed by Contractor in connection with the Work or any part of the Work contemplated by this Contract. The record shall be kept open at all

reasonable hours to the inspection of County and to the Division of Labor Standards Enforcement of the DIR.

26.2.3 Pursuant to Labor Code Section 1813, Contractor shall as a penalty to the County forfeit the statutory amount for each worker employed in the execution of this Contract by Contractor or by any Subcontractor for each calendar day during which such worker is required or permitted to work more than eight (8) hours in any one calendar day and forty (40) hours in any one calendar week in violation of the provisions of Article 3 (commencing with Section 1810), chapter 1, part 7, division 2, of the Labor Code.

26.2.4 Any Work necessary to be performed after regular working hours, or on Sundays or other holidays shall be performed without additional expense to the County.

26.3 Payroll Records

26.3.1 County will use the Alameda County Contract Compliance System, including the Elation Systems, Inc. program, to monitor contract and labor compliance. Contractor shall use the Compliance System to meet County's requirements, and shall participate in training as directed by County in order to become and remain competent in the use of the Compliance System.

26.3.2 Pursuant to the provisions of section 1776 of the Labor Code, notice is hereby given that Contractor shall prepare and provide to the County and shall cause each Subcontractor performing any portion of the Work under this Contract to prepare and provide to the County an accurate and certified payroll record ("CPR(s)"), showing the name, address, social security number, work classification, straight time, and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by the Contractor and/or each Subcontractor in connection with the Work.

26.3.3 The CPRs enumerated hereunder shall be certified and shall be provided to the County on a weekly basis. The CPRs from the Contractor and each Subcontractor for each week shall be provided on or before Wednesday of the week following the week covered by the CPRs. County shall not make any payment to Contractor until:

26.3.3.1 Contractor and/or its Subcontractor(s) provide CPRs acceptable to the County, and

26.3.3.2 The County is given sufficient time to review and/or audit the CPRs to determine their acceptability. Any delay in Contractor and/or its Subcontractor(s) providing CPRs to the County in a timely manner will directly delay the County's review and/or audit of the CPRs and Contractor's payment.

26.3.4 All CPRs shall be available for inspection at all reasonable hours at the principal office of Contractor on the following basis:

26.3.4.1 A certified copy of an employee's CPR shall be made available for inspection or furnished to the employee or his/her authorized representative on request.

26.3.4.2 CPRs shall be made available for inspection or furnished upon request to a representative of County, Division of Labor Standards Enforcement, Division of Apprenticeship Standards, and/or the Department of Industrial Relations.

26.3.4.3 CPRs shall be made available upon request by the public for inspection or copies thereof made; provided, however, that a request by the public shall be made through either the County, Division of Apprenticeship Standards or the Division of Labor Standards Enforcement. If the requested CPRs have not been provided pursuant to the provisions herein, the requesting party shall, prior to being provided the records reimburse the costs of preparation by Contractor, Subcontractors, and the entity through which the request was made. The public shall not be given access to the records at the principal office of Contractor.

26.3.5 The form of certification for the CPRs shall be as follows:

I, (Name-Print), the undersigned, am the (Position in business) with the authority to act for and on behalf of (Name of business and/or Contractor), certify under penalty of perjury that the records or copies thereof submitted and consisting of (Description, number of pages) are the originals or true, full, and correct copies of the originals which depict the payroll record(s) of actual disbursements by way of cash, check, or whatever form to the individual or individual named, and (b) we have complied with the requirements of sections 1771, 1811, and 1815 for any work performed by our employees on the Project.

Date: Signature:

(Section 16401 of the California Code of Regulations)

26.3.6 Each Contractor shall file a certified copy of the CPRs with the entity that requested the records within ten (10) days after receipt of a written request.

26.3.7 Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by County, Division of Apprenticeship Standards, or Division of Labor Standards Enforcement shall be marked or obliterated in such a manner as to prevent disclosure of an individual's name, address, and social security number. The name and address of Contractor awarded Contract or performing Contract shall not be marked or obliterated.

26.3.8 Contractor shall inform County of the location of the records enumerated hereunder, including the street address, city, and county, and shall, within five (5) working days, provide a notice of change of location and address.

26.3.9 In the event of noncompliance with the requirements of this section, Contractor shall have ten (10) days in which to comply subsequent to receipt of written notice specifying in what respects Contractor must comply with this section. Should noncompliance still be evident after the ten (10) day period, Contractor shall, as a penalty to County, forfeit twenty-five dollars ($25) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of Division of

Apprenticeship Standards or Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due.

26.3.10 It shall be the responsibility of Contractor to ensure compliance with the provisions of Labor Code section 1776.

26.4 Apprentices

26.4.1 Contractor acknowledges and agrees that, if this Contract involves a dollar amount greater than or a number of working days greater than that specified in Labor Code section 1777.5, then this Contract is governed by the provisions of Labor Code Section 1777.5. It shall be the responsibility of Contractor to ensure compliance with this Article and with Labor Code section 1777.5 for all apprenticeship occupations.

26.4.2 Apprentices of any crafts or trades may be employed and, when required by Labor Code section 1777.5, shall be employed provided they are properly registered in full compliance with the provisions of the Labor Code.

26.4.3 Every such apprentice shall be paid the standard wage paid to apprentices under the regulations of the craft or trade at which he/she is employed, and shall be employed only in the work of the craft or trade to which she/he is registered.

26.4.4 Only apprentices, as defined in section 3077 of the Labor Code, who are in training under apprenticeship standards and written apprentice agreements under Chapter 4 (commencing at section 3070), division 3, of the Labor Code, are eligible to be employed. The employment and training of each apprentice shall be in accordance with the provisions of the apprenticeship standards and apprentice agreements under which he/she is training.

26.4.5 Pursuant to Labor Code section 1777.5, if that section applies to this Contract as indicated above, Contractor and any Subcontractors employing workers in any apprentice able craft or trade in performing any Work under this Contract shall apply to the applicable joint apprenticeship committee for a certificate approving the Contractor or Subcontractor under the applicable apprenticeship standards and fixing the ratio of apprentices to journeymen employed in performing the Work.

26.4.6 Pursuant to Labor Code section 1777.5, if that section applies to this Contract as indicated above, Contractor and any Subcontractor may be required to make contributions to the apprenticeship program.

26.4.7 If Contractor or Subcontractor willfully fails to comply with Labor Code section 1777.5, then, upon a determination of noncompliance by the Administrator of Apprenticeship, it shall:

26.4.7.1 Be denied the right to bid on any subsequent project for one (1) year from the date of such determination;

26.4.7.2 Forfeit as a penalty to County the full amount as stated in Labor Code section 1777.7. Interpretation and enforcement of these provisions shall be in accordance with the rules and procedures of the California Apprenticeship Council and under the authority of the Chief of the Division of Apprenticeship Standards.

26.4.8 Contractor and all Subcontractors shall comply with Labor Code section 1777.6, which section forbids certain discriminatory practices in the employment of apprentices.

26.4.9 Contractor shall become fully acquainted with the law regarding apprentices prior to commencement of the Work. Special attention is directed to Sections 1777.5, 1777.6, and 1777.7 of the Labor Code, and title 8, California Code of Regulations, section 200 et seq. Questions may be directed to the State Division of Apprenticeship Standards, 455 Golden Gate Avenue, San Francisco, California 94102.

26.5 Non-Discrimination

26.5.1 Contractor herein agrees not to discriminate in its recruiting, hiring, promotion, demotion, or termination practices on the basis of race, religious creed, national origin, ancestry, sex, age, or physical handicap in the performance of this Contract and to comply with the provisions of the California Fair Employment and Housing Act as set forth in part 2.8 of division 3 of the California Government Code, commencing at section 12900; the Federal Civil Rights Act of 1964, as set forth in Public Law 88-352, and all amendments thereto; Executive Order 11246, and all administrative rules and regulations found to be applicable to Contractor and Subcontractor.

26.5.2 Special requirements for Federally Assisted Construction Contracts: During the performance of this Contract, Contractor agrees to incorporate in all subcontracts the provisions set forth in Chapter 60-1.4(b) of Title 41 published in Volume 33 No. 104 of the Federal Register dated May 28, 1968.

26.6 Labor First Aid

Contractor shall maintain emergency first aid treatment for Contractor's workers on the Project which complies with the Federal Occupational Safety and Health Act of 1970 (29 U.S.C. § 651 et seq.) and the California Occupational Safety and Health Act of 1973 (8 Cal. Code of Regs., §1 et seq.).

27. MISCELLANEOUS

27.1 Assignment of Antitrust Actions

27.1.1 Section 7103.5(b) of the Public Contract Code states:

In entering into a public works contract or subcontract to supply goods, services, or materials pursuant to a public works contract, the Contractor or subcontractor offers and agrees to assign to the awarding body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, made and become effective at the time the awarding body tenders final payment to the Contractor, without further acknowledgment by the parties.

27.1.2 Section 4552 of the Government Code states:

In submitting a bid to a public purchasing body, the bidder offers and agrees that if the bid is accepted, it will assign to the purchasing body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods,

materials, or services by the bidder for sale to the purchasing body pursuant to the bid. Such assignment shall be made and become effective at the time the purchasing body tenders final payment to the bidder.

27.1.3 Section 4553 of the Government Code states:

If an awarding body or public purchasing body receives, either through judgment or settlement, a monetary recovery for a cause of action assigned under this chapter, the assignor shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the public body any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the public body as part of the bid price, less the expenses incurred in obtaining that portion of the recovery.

27.1.4 Section 4554 of the Government Code states:

Upon demand in writing by the assignor, the assignee shall, within one year from such demand, reassign the cause of action assigned under this part if the assignor has been or may have been injured by the violation of law for which the cause of action arose and (a) the assignee has not been injured thereby, or (b) the assignee declines to file a court action for the cause of action.

27.1.5 Under this Article, "public purchasing body" is County and "bidder" is Contractor.

27.2 Excise Taxes

If, under Federal Excise Tax Law, any transaction hereunder constitutes a sale on which a Federal Excise Tax is imposed and the sale is exempt from such Federal Excise Tax because it is a sale to a State or Local Government for its exclusive use, County, upon request, will execute documents necessary to show (1) that County is a political subdivision of the State for the purposes of such exemption, and (2) that the sale is for the exclusive use of County. No Federal Excise Tax for such materials shall be included in any Contract Price.

27.3 Taxes

Contract Price is to include any and all applicable sales taxes or other taxes that may be due in accordance with section 7051 of the Revenue and Taxation Code; Regulation 1521 of the State Board of Equalization or any other tax code that may be applicable.

27.4 Shipments

All shipments must be F.O.B. destination to Site or sites, as indicated in the Contract Documents. There must be no charge for containers, packing, unpacking, drayage or insurance. The total Contract Price shall be all inclusive (including sales tax) and no additional costs of any type will be considered.

END OF DOCUMENT

DOCUMENT 00 73 13

SPECIAL CONDITIONS

1. Mitigation Measures

Contractor shall comply with all applicable mitigation measures, if any, adopted by any public agency with respect to this Project pursuant to the California Environmental Quality Act. (Public Resources Code section 21000 et. seq.)

2. Substitution for Specified Items

2.2. Requests for substitutions after award of the Contract shall be within **THIRTY-FIVE** (**35**) days of the date of the Notice of Award.

2.3. Whenever in the Specifications any materials, process, or article is indicated or specified by grade, patent, or proprietary name, or by name of manufacturer, that Specification shall be deemed to be followed by the words "or equal." Contractor may, unless otherwise stated, offer any material, process, or article **that shall be substantially equal or better in every respect to that so indicated or specified**.

2.3.1. If the material, process, or article offered by Contractor is not, in the opinion of the County, substantially equal or better in every respect to that specified, then Contractor shall furnish the material, process, or article specified in the Specifications without any additional compensation or change order.

2.3.2. This provision shall not be applicable with respect to any material, product, thing or service for which County made findings and gave notice in accordance with Public Contract Code section 3400(b); therefore, Contractor shall not be entitled to request a substitution with respect to those materials, products or services.

2.4. A request for a substitution shall be in writing and shall include:

2.4.1. All variations of the proposed substitute from the material specified including, but not limited to, principles of operation, materials, or construction finish, thickness or gauge of materials, dimensions, weight, and tolerances;

2.4.2. Available maintenance, repair or replacement services;

2.4.3. Increases or decreases in operating, maintenance, repair, replacement, and spare parts costs;

2.4.4. Whether or not acceptance of the substitute will require other changes in the Work (or in work performed by the County or others under Contract with the County); and

2.4.5. The time impact on any part of the Work resulting directly or indirectly from acceptance of the proposed substitute.

2.5. No substitutions shall be made until approved, in writing, by the County. The burden of proof as to equality of any material, process, or article shall rest with Contractor. The Contractor warrants that if substitutes are approved:

2.5.1. The **proposed substitute is equal or superior in all respects** to that specified, and that such proposed substitute is suitable and fit for the intended purpose and will perform adequately the function and achieve the results called for by the general design and the Contract Documents;

2.5.2. The Contractor provides the same warranties and guarantees for the substitute that would be provided for that specified;

2.5.3. The Contractor shall be fully responsible for the installation of the substitute and any changes in the Work required, either directly or indirectly, because of the acceptance of such substitute, **with no increase in Contract Price or Contract Time**. Incidental changes or extra component parts required to accommodate the substitute will be made by the Contractor without a change in the Contract Price or Contract Time;

2.5.4. The Contractor shall be responsible for any re-design costs occasioned by County's acceptance and/or approval of any substitute; and

2.5.5. The Contractor shall, in the event that a substitute is less costly than that specified, **credit the County with one hundred percent (100%) of the net difference between the substitute and the originally specified material**. In this event, the Contractor agrees to execute a deductive Change Order to reflect that credit.

2.6. In the event Contractor furnishes a material, process, or article more expensive than that specified, the difference in the **cost of that material, process, or article so furnished shall be borne by Contractor.**

2.7. In no event shall the County be liable for any increase in Contract Price or Contract Time due to any claimed delay in the evaluation of any proposed substitute or in the acceptance or rejection of any proposed substitute.

3. Weather Days

3.1 Delays due to adverse weather conditions will only be permitted in compliance with the provisions in the General Conditions and only if the number of days of adverse weather exceeds the following parameters and only if Contractor can verify that adverse weather caused delays exceeded the following number of days:

3.1.1 Four (4) weather days for roofing scope of work.

4. **Insurance Policy Limits**. All of Contractor's insurance shall be with insurance companies with an A.M. Best rating of no less than A: XI. The limits of insurance shall not be less than:

Type of Insurance Coverages		**Minimum Limits**
Commercial General Liability	Premises Liability; Products and Completed Operations; Contractual Liability; Personal Injury and Advertising Liability	$1,000,000 per occurrence (CSL), Bodily Injury and Property Damage
Commercial or Business Automobile Liability – Any Auto	All owned vehicles, hired or leased vehicles, non-owned, borrowed and permissive uses.	$1,000,000 per occurrence (CSL), Any Auto, Bodily Injury and Property Damage
Workers Compensation	(Intentionally Blank)	Statutory Limits
Employers Liability	(Intentionally Blank)	$1,000,000 per accident for bodily injury or disease
Endorsements and Conditions	Additional Insured: All insurance required above with the exception of Commercial or Business Automobile Liability, Workers' Compensation and Employer Liability, shall be endorsed to name as additional insured: County of Alameda, its Board of Supervisors, the individual members thereof, and all County officers, agents, employees, volunteers, and representatives. The Additional Insured endorsement shall be at least as broad as ISO Form Number CG 20 38 04 13.	

5. Permits, Certificates, Licenses, Fees, Approval

5.1 **Payment for Permits, Certificates, Licenses, and Fees**. As required in the General Conditions, the Contractor shall secure and pay for all permits, licenses and certificates necessary for the prosecution of the Work with the exception of the following:

2.7.1. E.g. (water connection fees)

2.7.2. E.g. (sewer connection fees)

With respect to the above listed items, Contractor shall be responsible for securing such items, however, County will be responsible for payment of these charges or fees. Contractor shall notify the County of the amount due with respect to such items and to whom the amount is payable. Contractor shall provide the County with an invoice and receipt with respect to such charges or fees.

6. Work Restrictions

Hours of Work: **7:00am to 4:00pm Monday to Friday** except County holidays.

Access to Site: Anytime during specified Hours of Work unless approved by County in writing **at least 72 hours in advance**.

Phasing: Not applicable for this Project.

END OF DOCUMENT

DOCUMENT 00 73 49

PROJECT STABILIZATION/COMMUNITY BENEFIT AGREEMENT of the COUNTY OF ALAMEDA and California Prevailing Wage Requirements

1. Summary

1.1. In addition to Labor, Wage & Hour, Apprentice, and related provisions described in Document 00 72 13 Paragraph 26; the Work performed pursuant to this Contract is subject to the requirements of the "PROJECT STABILIZATION/COMMUNITY BENEFITS AGREEMENT for the COUNTY OF ALAMEDA" ("PSCBA"). The Contractor agrees to be party to and bound by the "PROJECT STABILIZATION/COMMUNITY BENEFITS AGREEMENT for the COUNTY OF ALAMEDA". Contractor agrees to execute the "PROJECT STABILIZATION/ COMMUNITY BENEFITS AGREEMENT for the COUNTY OF ALAMEDA Letter of Assent" and shall require all of its subcontractors, of whatever tier, to become similarly bound for all work within the scope of this Contract by signing an identical Letter of Assent.

2. PROJECT STABILIZATION/COMMUNITY BENEFIT AGREEMENT Of the COUNTY OF ALAMEDA

2.1. The PROJECT STABILIZATION/COMMUNITY BENEFITS AGREEMENT for the COUNTY OF ALAMEDA (PSCBA) is included for reference only in PROJECT STABILIZATION/COMMUNITY BENEFITS AGREEMENT for the COUNTY OF ALAMEDA Document 00 73 49B.

2.1.1. ROLES AND RESPONSIBILITIES SUBCONTRACTS

2.1.1.1. Each Contractor, which includes all subcontractors of any tier, including trucking entities performing Covered Work of this Contract, agrees that neither it nor any of its subcontractors will subcontract any Work of this Contract except to a person, firm, or corporation who is or becomes party to the PSCBA by signing the Letter of Assent attached to the PSCBA as Exhibit "A". All Contractors performing Covered Work of this Contract shall, as a condition to performing Work of this Contract, become Signatory to and perform all work under the terms of the PSCBA.

2.1.1.2. Each Contractor, which includes all subcontractors of any tier performing Work of this Contract, shall give written notice to the Union(s) of any subcontract involving the performance of work covered by the PSCBA **within either five (5) business days of executing a contract** with such subcontract or before the subcontractor commences work on the Project,

whichever occurs first. Such notice shall specify the name and address of the subcontractor, the California State License Board license number of the Contractors and scope of work to be performed. Written notice at a Pre-Job Conference shall be deemed written notice under this provision only for those subcontractors listed at the Pre-Job Conference

2.1.1.3. The Contractor shall be responsible for PSCBA compliance by all subcontractor and lower tier subcontractor.

2.1.2. WORK ASSIGNMENTS AND JUSIDICTIONAL DISPUTES

2.1.2.1. The assignment of the Work to subcontractors is solely the responsibility of the Contractor.

2.1.2.2. Each Contractor shall conduct a Pre-Job Conference with the Building and Construction Trades Council of Alameda County (Council) prior to commencing Work as specified in Paragraph 2.1.3 of this Document 00 73 49. The Contractor will notify the County in advance of all such conferences.

2.1.2.3. Any jurisdictional disputes regarding the assignment of the Work of this Contract will be resolved per the requirements of the PSCBA.

2.1.3. PRE-JOB CONFERENCE

2.1.3.1. A mandatory Pre-Job Conference and/or Mark-Up Meeting will be held prior to the commencement of work to establish the scope of work in each Contractor and Subcontractor contract. All meeting shall be held at the offices of the Alameda County Building and Construction Trades Council.

2.1.3.2. The Contractor performing the work shall have the responsibility for making work assignments in accordance with the PSCBA, and will be required to bring relevant plans, specifications, and blueprints to the meeting, as requested by the Union

2.1.3.3. Contractor must submit written workforce projections at the Pre-Job Conference. The workforce projections shall include projected man-hours on a craft-by-craft basis, consistent with the Contractor's bid proposal.

2.1.3.4. The County will schedule and attend all Pre-Job and Mark-Up Meetings and participate in discussions as they pertain to the terms and conditions of the PSCBA.

2.1.4. JOINT ADMINISTRATIVE COMMITTEE MEETINGS

2.1.4.1. The Joint Administrative Committee (JAC) has been established to monitor compliance with the PSCBA. The JAC meets monthly and reviews monthly reporting by the Contractor.

2.1.4.2. The Contractors shall provide progress report as described in Paragraph 2.1.8 of this Document.

2.1.5. COORDINATOR

2.1.5.1. The County will designate a Coordinator, who will be responsible for the administration and application of the PSCBA.

2.1.6. LOCAL HIRING PROGRAM

2.1.6.1. The Contractor agrees to achieve the inclusion of Residents as defined in the PSCBA in the employment and apprenticeship opportunities created by the Work of this Contract, which will be known as the Local Hiring Program (LHP) as described in the PSCBA.

2.1.6.2. The Contractor agrees to a goal that **Residents of the County will perform forty percent (40%) of all hours worked on the Work of this Contract**, on a craft-by-craft basis, if such workers are available, capable and willing to work on the projects, together with the apprentice goals described in Paragraph 2.1.7 of this Document.

2.1.6.3. The Contractors and subcontractors shall make good faith efforts to reach these goals, as described in the PSCBA including but not limited to the following:

2.1.6.3.1. **Within one week of the issuance of the Notice to Proceed**, the Contractors shall meet with the County to review and approve its compliance plan for reaching the Local Hiring Goals, using the required compliance plan form provided by the County.

2.1.6.3.2. Submit copies of hiring hall dispatch requests and responses to the County **within ten (10) days of County's request** at any point during the execution of the Work of this Contract.

2.1.6.3.3. Immediately contact the County if a union hiring hall dispatcher will not or cannot, upon request of the Contractor, dispatch local residents.

2.1.6.3.4. Use the "Name Call," "Rehire" or other available hiring hall procedures to reach goals and shall provide documentation of such requests to the County upon request.

2.1.6.3.5. Use community based organizations as a resource for local labor resources, if a union will not or cannot provide local Residents as requested

2.1.6.3.6. Sponsor local Residents for apprenticeship, when possible.

2.1.6.3.7. Maintain records for each Resident of Alameda County who was referred but not hired along with an explanation why the worker was not hired.

2.1.6.3.8. Document participation in any local employment training programs and submit documentation of such to the County **within ten (10) days if requested by County.**

2.1.6.3.9. To the extent possible, the parties agree to implement the Local Hiring Program while complying with the County's Local Vendor Preference and Enhanced Construction Outreach (ECOP) programs for the work of this Contract. To the extent that the County determines, in its sole discretion, that there is a conflict between the Local Hiring Program established in the PSCBA and the County's SLEB, ECOP, and/or Local Vendor Preference Programs, the conflict shall be resolved in favor of the Local Hiring Program of the PSCBA.

2.1.6.3.10. For the purpose of reaching the goal established in Paragraph 2.1.6.2 of this Document, a Contractor may qualify for full credit toward the goal by employing Alameda County Residents for other work the Contractor is performing in any of the nine Bay Area counties of: Alameda, Contra Costa, San Francisco, San Mateo, Santa Clara, Marin, Solano, Napa and Sonoma as outlined in the PSCBA.

2.1.7. APPRENTICES

2.1.7.1. Although the PSCBA states that the County shall make available to the Unions a database of apprentices qualifying under the local hiring provision of the PSCBA, the County has not developed this database. Contractor is to contact the Unions for available apprentices.

2.1.7.1.1. For each Covered Project, the Contractors will be responsible to ensure that it and/or its subcontractors **hire at least one (1) new apprentice for the first $1 million of construction value** and for each succeeding $5 million of construction contract value, the Contractors and/or their subcontractors will be required to hire at least one (1) additional new apprentice. All such apprentices may be graduates of pre apprenticeship programs with known and successful track record of apprentice placement into jobs. All the pre apprenticeship program

graduates must be Residents of Alameda County and members of a Disadvantaged Population, as described in the PSCBA.

2.1.7.2. Contractors shall exercise their best efforts to recruit apprenticeship program applicants from Residents and who are members of a Disadvantaged Population as described in the PSCBA

2.1.7.3. The Contractor shall request dispatch of apprentices in writing from the local Unions and/or Joint Apprenticeship Training Committee in which the Contractor participates. Copies of the written requests shall be provided to the County **within ten (10) days of request by the Coordinator.**

2.1.7.4. For the purposes of meeting the goal established in Paragraph 2.1.6.1 of this Document, a Contractor may qualify for full credit toward the goal by employing Alameda County Residents as apprentices for other work the Contractor is performing in any of the nine Bay Area counties of: Alameda, Contra Costa, San Francisco, San Mateo, Santa Clara, Marin, Solano, Napa and Sonoma as described in the PSCBA

2.1.8. DATA COLLECTION AND REPORTING

2.1.8.1. This Paragraph describes Contractor and data collection, reporting guidelines and responsibilities for the PSCBA.

2.1.8.2. On a monthly basis, Contractors must submit reports to the County on the status and progress of local hiring on a craft-by-craft basis, including utilization of apprentices as described in Document 00 73 49A "PSCBA Forms".

2.1.9. HELMETS TO HARDHATS: VETERAN EMPLOYMENT

2.1.9.1. The Contractor agrees to utilize the series of the Center for Military Recruitment, Assessment and Veterans Employment (hereinafter "Center") and Center's "Helmets to Hardhats" program to serve as a resources for preliminary orientations, assessment of construction aptitude, referral to apprenticeship programs or hiring halls, counseling and mentoring, support network, employment opportunities and other needs as described in the PSCBA.

2.1.9.2. The Contractors may also utilize the services of the "Swords to Ploughshares" program.

3. <u>California Labor Code</u>: In addition to complying with the PSCBA, Contractor shall also comply with the California Labor Code prevailing wage requirements.

3.1. Pursuant to Labor Code Section 1770, *et seq*., the Contractor shall pay to persons performing labor in and about the Work provided for in the Contract an amount **equal to**

or more than the general prevailing rate of per diem wages for work of a similar character in the locality in which the Work is performed, and not less than the general prevailing rate of per diem wages for legal holiday and overtime work in said locality, which per diem wages shall be equal to or more than the stipulated rates contained in a schedule thereof which has been ascertained and determined by the Director of the State Department of Industrial Relations to be the general prevailing rate of per diem wages for each craft or type of workman or mechanic needed to execute this contract. The Contractor shall also cause a copy of this determination of the prevailing rate of per diem wages to be posted at each Site.

3.2. The Contractor shall **forfeit, as a penalty to the County, fifty dollars ($50.00) for each laborer, workman, or mechanic employed** in performing labor in and about the work provided in the Contract Documents **for each day, or portion thereof, on which such laborer, workman or mechanic is paid less than the said stipulated rates for any work** done under these Contract Documents by him or her or by any Subcontractor or designer under him or her, in violation of Articles 1 and 2 of Chapter 1 of Part 7 of Division II of the Labor Code. The sums and amounts which shall be forfeited pursuant to this paragraph 3.2 and the terms of the Labor Code shall be withheld and retained from payments due or to become due to the Contractor under this Contract and the terms of the Labor Code, but no sum shall be so withheld, retained or forfeited except from the final payment without a full investigation by either the State Department of Industrial Relations or by the County. The final amount of forfeiture shall be determined by the Labor Commissioner pursuant to Labor Code § 1775.

3.3. The Contractor shall insert in every subcontract or other arrangement which Contractor may make for performance of work or labor on the Work provided for in the Contract Documents, a provision that the Subcontractor shall pay persons performing labor or rendering service under subcontract or other arrangement not less than the general prevailing rate of per diem wages for work of a similar character in the locality in which the Work is performed, and not less than the general prevailing rate of per diem wages for holiday and overtime work fixed as provided in the Labor Code.

3.4. The Contractor stipulates that it shall comply with all applicable wage and hour laws, including without limitation Labor Code § 1813.

4. Project Stabilization/Community Benefits Agreement/ Labor Compliance Program Monitoring.

4.1. The County has elected to retain the services of a third party to monitor compliance with the PSCBA and California Labor Code Requirement.

4.2. The PSCBA/Labor Compliance Program ("PSCBA/LCP") will enforce PSCBA, prevailing wage, apprentice employment and local hiring requirements consistent with California Labor Code and the PSCBA. PSCBA/LCP services do not limit the scope of Work and do not relieve the Contractor of any responsibility for coordination of the Work with California Labor Code or the PSCBA.

4.3. The Contractor shall be responsible for any costs that the County incurs as the result of any actions taken by DIR, or by the County when exercising its enforcement duties, to address Contractor and/or Subcontractor violations related to California Labor Code or the PSCBA. If the Contractor or any of its Subcontractor are notified that they should take certain actions to be in compliance with the PSCBA or applicable state law and those actions are not taken or not taken in a timely manner, then the County shall have the right to recover the cost of all work performed by or for the County or its contractors from the date of such notice and the County shall have the right to back charge the Contractor for any and all costs associated with such work.

4.4. Certified payroll reports for the duration of the Project shall be maintained by the Contractor and submitted electronically, and are subject to all of the following conditions:

4.4.1. Certified Payroll Reports (CPR) shall be submitted to the County electronically on the web-based software system, described in Document 00 45 46.01 "Prevailing Wage and Related Labor Requirements Certification", to be utilized for collection and verification of payroll reports for the Project.

4.4.2. CPR must contain all of information required by California Labor Code section 1776 and must be organized in a manner that is similar or identical to the format in which the information is reported on the DIR "Public Works Payroll Reporting Form" (Form A-1-131);

4.4.3. **Statement of Compliance**. CPR shall be accompanied by a signed "Statement of Compliance" certifying that the payroll reports are correct and complete and that each laborer or mechanic has been paid not less than the proper prevailing wage rate for the work performed. The wording of the certification shall comply with California Labor Code section 1776 and 29 C.F.R. § 5.5(a)(3)(ii)(B)-(D).

4.4.4. Electronic CPR submitted to the County, the DIR Division of Labor Standards Enforcement (DLSE), or other entity within the DIR, must be in the form of a non-modifiable image or record that bears an electronic signature or includes a copy of any original certification made on paper. Printed reports submitted on paper with an original signature will be accepted as supplemental information to electronic reports, and will not relieve the Contractor or its Subcontractor from their obligation to submit electronic reports.

4.4.5. **Apprenticeship Program**. Reference is made to General Conditions Document 00 72 13, Paragraph 26 and the PSCBA for the Contractor and its Subcontractors obligation to comply, and be responsible for ensuring compliance, with the requirements of the California Labor Code provisions concerning the employment of apprentices, including Labor Code sections 1776, 1777.5, and 1777.6.

END OF DOCUMENT

DOCUMENT 00 73 49A

PROJECT STABILIZATION/COMMUNITY BENEFIT AGREEMENT of the COUNTY OF ALAMEDA FORMS

1. Summary

1.1. The Contractor and each subcontractor at all tiers must complete and submit all forms required by the Labor Compliance Program Guidebook included in this DOCUMENT 00 73 49A "PSCBA FORMS".

END OF DOCUMENT

Labor Management Consultants
1630 12th Street
Oakland, CA 94607
www.davillier-sloan.com

Labor Compliance Program Guidebook

Please provide this packet to all subcontractors with instruction that they provide it to all lower tier subcontractors. The Design-Build contractor is ultimately responsible for labor compliance on the entire project.

Labor Compliance

Emilija Besic
(510) 385-1261
emilija@davilliersloan.com

Labor Compliance

Debra Moore
(510) 673 - 8300
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Labor Compliance

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Certified Payroll

Elation Systems, Inc.
(925) 924 - 0340
support@elationsystems.com

The information in this Guidebook is for general guidance on the matters of Labor Compliance monitoring. Davillier-Sloan, Inc. makes every attempt to ensure the information contained in the Guidebook is free from errors and obtained from accurate and current sources. Davillier-Sloan, Inc. reserves the right, at its discretion, to change or modify all or any part of this packet. Periodically revised updated copies may be obtained by emailing a request to: info@davillier-sloan.com

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Section 1:
Introduction

A. Overview

B. Prevailing Wage Determinations

C. Site Visits

D. Required Forms

E. Project/Program Closeout

F. Apprenticeship Utilization

Overview

Davillier-Sloan, Inc. (DSI) is a third party Labor Compliance Program (LCP) administrator. This LCP Guidebook has been developed for your reference and highlights the requirements, submittals and timelines necessary to be compliant with the program.

Certified Payrolls for this project will be submitted electronically into the Elation web based program. Related forms will be available online and should be accessed and downloaded according to the instructions provided by Elation Systems once you have registered on the site.

The law requires that all workers including employees, independent contractors, owner-operators etc. on a public works project must be paid the prevailing wage of the area in which the project is located. Detailed information pertaining to labor compliance may be found in the contract specifications.

Prevailing Wage Determinations

The California prevailing wage determinations are based on the first bid advertisement/publication date. For design build projects, the construction contract signing/construction contract award date shall be considered the bid advertisement date.

The California prevailing wage determinations and rates are published twice each year, in February and August. All determinations are effective ten (10) days after issuance. Some trades are issued regionally (Northern and Southern California) and other sub trades are by the county in which the project is located. There are separate determinations for apprentices on public works.

The prevailing wage determination by craft can be found on the Department of Industrial Relations (DIR) web site: www.dir.ca.gov (Labor Law/Public Works). Prevailing wage determinations and any rate changes must be posted at the job site available for workers to view.

Asterisk (*) clarifications:

- Prevailing wage determinations with a single asterisk (*) after the expiration date, which are in effect on the date of advertisement of bids, remain in effect for the life of the project.

- Interested parties should contact the DIR at (415) 703-4774 for the new rates after ten (10) days from the expiration date (if no subsequent determination is required).

- Prevailing wage determinations with double asterisks (**) after the expiration date indicate that the basic hourly rate, overtime, holiday pay and employers' payments for work performed after this date have been predetermined. If work is to extend past this date, the new rates must be paid and should be incorporated into contracts entered now.

Site Visits

Site visits will be conducted weekly pursuant to Labor Code 16432(d). Information on certified payrolls will be verified by visual inspection and random in-person worker interviews.

Required Forms

The required forms are available for download in the Elations system. Copies of completed, signed forms should be forwarded to the appropriate agency and uploaded into Elation for verification.

Prior to Construction Forms

1. Checklist of Labor Law Requirements
   The Design-Build contractor and each subcontractor at all tiers must complete and submit this form acknowledging the California Labor Codes Regulations governing public works projects.

2. Division of Apprenticeship Standards Form DAS 140
   Public Works Contract Award Information
   - The Design-Build contractor and each subcontractor at all tiers must complete and submit this form to the local Apprenticeship Committee to inform them of the award of your contract.

   - Submit the DAS 140 to the Joint Apprenticeship Training Committee (JATC) for each apprentice able craft or trade within the area of the project site. The Design-Build contractor and each subcontractor at all tiers must submit this form within ten (10) days of the date of the execution of the contract but no later than the first day the contractor has workers employed on-site.

3. Division of Apprenticeship Standards Form DAS 142
   Request for Dispatch of an Apprentice
   - The Design-Build contractor and each subcontractor at all tiers must complete and submit a Request for Dispatch of an Apprentice in writing at least 72 business hours prior to the date apprentices are needed.

   - Submit the DAS 142 to each of the JATCs in the area of the project for each apprenticeable craft, until the required number of apprentices has been provided. If the required number of apprentices is not provided and a request has been submitted to all of the Committee's in the area of the project, then the contractor shall be considered in compliance.

During Construction Forms

1. Statement of Employer Payments
   - Must be submitted with the first certified payroll, when prevailing wage rates are updated, and when there is a change in fringe benefits.
   - Additional annuity payments can be indicated in the notes section of the CPR and a union dispatch slip should be uploaded into the Elation System.

2. California Apprentice Council Training Fund Contribution (CAC –2)
   The training fund contributions to the CAC are due on the 15th of each month for work performed during the preceding month. Refer to the DIR applicable prevailing wage

determinations for the amount owed for each hour of work performed for journeymen and apprentices.

3. Statement of Non-Performance (when applicable)
   - i This form is submitted when the contractor is not working on the job site for a period of more than one week but has not completed their work. Does not need to be submitted until after the first certified payroll report is received.

   - i One form may be submitted for consecutive non-performing weeks.

4. Certified Payroll Reporting Form
   - i Any person employed upon the project that is working with tools must be listed on the certified payroll including but not limited to owners, operators, surveyors, and foremen.

   - i The certified payroll records shall be submitted and maintained electronically subject to the following conditions:

     i. The certified payroll reports contain all of the information required by California Labor Code Section 1776. The information must include name, address, social security number, craft, classification, wages, and hours worked.

     ii. The reports shall be in a format and/or use software that is readily accessible to Contractors, Awarding Bodies, LCPs, the DIR, and the DOL.

   - i Certified Payroll submitted to DSI, the DLSE, or another entity within the DIR must be in the form of a non-modifiable image or record that bears an electronic signature or includes a copy of any original certification made on paper.

   - i The requirements for redacting information shall be followed when certified payroll records are disclosed to the public pursuant to California Labor Code Section 1776(e). This requirement will apply whether the records are provided electronically or as hard copies.

   - i No Design-Build contractor or subcontractor shall be mandated to submit or receive electronic reports when it otherwise lacks the resources or capacity to do so, nor shall any Design-Build contractor or subcontractor be required to purchase or use proprietary software that is not generally available to the public.

5. Statement of Compliance Certificate
   A Statement of Compliance shall accompany each certified payroll record.

6. Verification of Apprenticeship Status (DAS)
   Verification is available on the DIR website at
   http://www.dir.ca.gov/DAS/appcertpw/AppCertSearch.asp.

Project/Program Closeout

Contractor Affidavit
Verifies the contractor's information, work classifications used, type of work completed, first payroll report date to final payroll report date, and how the apprenticeship utilization requirement was reached.

Apprenticeship Utilization

California Labor Codes require Contractors to hire apprentices unless the total construction contract for the project is less than $30,000 or it is not an apprenticeable craft.

Contractors, including Design-Build, General or Specialty subcontractors shall employ registered apprentices during the performance of public works in accordance with the required one (1) hour of work performed by an apprentice for every five (5) hours of work performed by a journeyman. Unless an exemption has been granted, the contractor shall employ apprentices for the number computed above, before the end of the contract or provide good faith effort documentation.

Section 2:
Prior to Construction Forms

A. Checklist of Labor Law Requirements

B. Public Works Contract Award Information (DAS 140 Form)

C. Request for Dispatch of an Apprentice (DAS 142 Form)

Checklist of Labor Law Requirements

(CCR Title 8, Section 16421)

Ultimately the prime contractor is liable for their sub and specialty contractors. This checklist is a useful tool for the prime contractor to ensure that their sub and specialty contractors know their responsibilities on public works projects. Contractors who understand and comply with the law are more likely to deliver the job on time, on budget and done right the first time. We suggest the prime contractor encourage completion of this checklist by their sub and specialty contractors.

NAME (PRINT) _____ DATE _____

COMPANY _____ PHONE _____

ADDRESS _____ FAX _____

CITY _____ STATE _____ ZIP CODE _____

PROJECT MANAGER _____ SUPERINTENDENT/FOREMAN _____

CERTIFIED PAYROLL _____ PHONE/EXT. _____

CONTRACTOR LICENSE NO. _____ EXP. DATE _____ SPECIALTY LICENSE NO. _____

SELF-INSURED CERTIFICATE NO. _____ WORKERS COMP. POLICY NO. _____

PROJECT NAME _____ PROJECT #/BID PACKAGE# _____

AWARDING BODY _____ ADVERTISEMENT DATE _____

IF SUB-CONTRACTING, LIST YOUR PRIME/GENERAL CONTRACTOR _____

CONTRACT AWARD AMOUNT _____

THE FEDERAL AND STATE LABOR LAW REQUIREMENTS APPLICABLE TO THE CONTRACT ARE COMPOSED OF, BUT NOT LIMITED TO, THE FOLLOWING:

☐ Payment of Prevailing Wage Rates

The contractor to whom the contract is awarded and its subcontractors hired for the public works project are required to pay not less than the specified general prevailing wage rates to all workers employed in the execution of the contract. *Labor Code Section 1770 et seq*.

The contractor is responsible for ascertaining and complying with all current general prevailing wage rates for crafts and any rate changes that occur during the life of the contract. Information on all prevailing wage rates and all rate changes are to be posted at the job site for all workers to view. Additionally, current wage rate information can be found at the DLSR web site, *www.dir.ca.gov/dlsr/statistics_research.html.*

☐ Apprentices

It is the duty of the contractor and subcontractors to employ registered apprentices on the public works project and to comply with all aspects of *Labor Code Section 1777.5*, relating to Apprentices on Public Works. (1) Notify approved apprenticeship programs of contract award; (2) employ apprentices; (3) pay training fund contributions.

☐ Penalties

There are penalties required for contractor's/subcontractor's failure to pay prevailing wages and for failure to employ apprentices, including forfeitures and debarment under *Labor Code Sections 1775; 1776; 1777.1; 1777.7 and 1813.*

☐ Certified Payroll Reports

Under *Labor Code Section 1776*, contractors and subcontractors are required to keep accurate payroll records showing the name, address, social security number and work classification of each employee and owner performing work; also the straight time and overtime hours worked each day for each week, the fringe benefits, and, the actual per diem wage paid to each owner, journey person, apprentice worker or other employee hired in connection with the public works project.

This requirement includes and applies to all subcontractors performing work on Awarding Body projects even if their portion of the work is less than one half of one percent (0.05%) of the total amount of the contract.

The certified payroll records shall contain the same data fields listed on the *Public Works Payroll Reporting Form (A-1-131)* and contain or is accompanied by a declaration made under penalty of perjury. *(California Code of Regulations, Section 16401).*

Prime Contractors are responsible for submittal of their payrolls and those of their respective subcontractors as one package. Any payroll not submitted in the proper form will be rejected. In the event that there has been no work performed during a

Checklist of Labor Law Requirements, continued

given week, the Certified Payroll Report shall be annotated: "No work" for that week or a Non-Performance Statement must be submitted.

Employee payroll records shall be certified and shall be made available for inspection at all reasonable hours at the principal office of the contractor/subcontractor, or shall be furnished to any employee, or his/her authorized representative on request, pursuant to *Labor Code Section 1776*.

Under *Labor Code Section 1776(g)* there are penalties required for contractor's/subcontractor's failure to maintain and submit copies of certified payroll records on request.

☐ **Nondiscrimination in Employment**

There exist prohibitions against employment discrimination under *Labor Code Sections 1735 and 1777.6,* the *Government Code,* the *Public Contracts Code,* and *Title VII of the Civil Rights Act of 1964.*

☐ **Kickbacks Prohibited**

Contractors and subcontractors are prohibited from recapturing wages illegally by accepting or extracting "kickbacks" from employee wages under *Labor Code Section 1778*.

☐ **Acceptance of Fees Prohibited**

There exists a prohibition against contractor/subcontractor acceptance of fees for registering any person for public work under *Labor Code Section 1779*; or for filling work orders on public works contracts pursuant to *Labor Code Section 1780*.

☐ **Listing of Subcontractors**

All prime contractors are required to list properly all subcontractors hired to perform work on the public works projects covering more than one-half of one percent, pursuant to *Government Code Section 4104*.

☐ **Proper Licensing**

Contractors are required to be licensed properly and to require that all subcontractors be properly licensed. Penalties are required for employing workers while unlicensed under *Labor Code Section 1021* and under the California Contractor License Law found at *Business and Professions Code Section 7000 et seq*.

☐ **Unfair Competition Prohibited**

Contractors and sub-contractors are prohibited from engaging in unfair competition as specified under *Business and Professions Code Sections 17200 to 17208.*

☐ **Workers Compensation Insurance**

Labor Code Section 1861 requires that contractors and subcontractors be insured properly for Workers Compensation.

☐ **OSHA**

Contractors and subcontractors are required to abide by the Occupational, Safety and Health laws and regulations that apply to the particular construction project.

☐ **Proof of Eligibility/Citizenship**

The federal prohibition against hiring undocumented workers, and the requirement to secure proof of eligibility/citizenship from all workers, is required.

☐ **Itemized Wage Statement**

Labor Code Section 226 requires that employees be provided with itemized wage statements.

CERTIFICATION

I acknowledge that I have been informed and am aware of the foregoing requirements and that I am authorized to make this certification on behalf of _____
(COMPANY NAME)

I fully understand that failure to comply with any of the above requirements may subject me, or my company, to penalties as provided above.

Contractor _____ _____
(SIGNATURE) (DATE)

Awarding Agency /Labor Compliance Program _____
(SIGNATURE) (DATE)

PUBLIC WORKS CONTRACT AWARD INFORMATION

Contract award information must be sent to your Apprenticeship Committee if you are approved to train. If you are not approved to train, you must send the information (which may be this form) to ALL applicable Apprenticeship Committees in your craft or trade in the area of the site of the public work. Go to: http://www.dir.ca.gov/das/PublicWorksForms.htm for information about programs in your area and trade. You may also consult your local Division of Apprenticeship Standards (DAS) office whose telephone number may be found in your local directory under California, State of, Industrial Relations, Division of Apprenticeship Standards.

Do not send this form to the Division of Apprenticeship Standards.

NAME OF YOUR COMPANY	CONTRACTOR'S STATE LICENSE NO
MAILING ADDRESS- NUMBER & STREET, CITY, ZIP CODE	AREA CODE & TELEPHONE NO.
NAME & ADDRESS OF PUBLIC WORKS PROJECT	DATE YOUR CONTRACT EXECUTED
	DATE OF EXPECTED OR ACTUAL START OF PROJECT
NAME & ADDRESS OF PUBLIC AGENCY AWARDING CONTRACT	ESTIMATED NUMBER OF JOURNEYMEN HOURS
	OCCUPATION OF APPRENTICE
THIS FORM IS BEING SENT TO: (NAME & ADDRESS OF APPRENTICESHIP PROGRAM(S))	ESTIMATED NUMBER OF APPRENTICE HOURS
	APPROXIMATE DATES TO BE EMPLOYED

This is not a request for dispatch of apprentices.

Contractors must make a separate request for actual dispatch, in accordance with Section 230.1(a) California Code of Regulations

Check One Of The Boxes Below

1. ☐ We are already approved to train apprentices by the _____ Apprenticeship Committee. We will employ and train under their Standards. Enter name of the Committee

2. ☐ We will comply with the standards of _____ Apprenticeship Committee for the duration of this job only. Enter name of the Committee

3. ☐ We will employ and train apprentices in accordance with the California Apprenticeship Council regulations, including § 230.1 (c) which requires that apprentices employed on public projects can only be assigned to perform work of the craft or trade to which the apprentice is registered and that the apprentices must at all times work with or under the direct supervision of journeyman/men.

Signature _____ *Date*

Typed Name _____

Title _____

State of California - Department of Industrial Relations DIVISION OF APPRENTICESHIP STANDARDS

REQUEST FOR DISPATCH OF AN APPRENTICE – DAS 142 FORM

DO NOT SEND THIS FORM TO DAS

You may use this form to request dispatch of an apprentice from the Apprenticeship Committee in the craft or trade in the area of the public work. Go to: http://www.dir.ca.gov/databases/das/pwaddrstart.asp for information about programs in your area and trade. You may also consult your local Division Apprenticeship Standards (DAS) office whose telephone number may be found in your local directory under California, State of, Industrial Relations, Division of Apprenticeship Standards. **Except for projects with less than 40 hours of journeyman work, you must request and employ apprentices in no less than 8 hour increments.**

Date:

Contractor Requesting Dispatch:

To Applicable Apprenticeship Committee:

Name: _____

Address: _____

_____

Tel. No. _____ **Fax No.** _____

Name: _____

Address: _____

_____

License No. _____

Tel. No. _____ **Fax No.** _____

Project Information:

Contract No. _____

Name of the Project: _____

Address: _____

Dispatch Request Information:

Number of Apprentice(s) Needed: _____ **Craft or Trade:** _____

Date Apprentice(s) to Report: _____ **(72 hrs. notice required)** **Time to Report:** _____

Name of Person to Report to: _____

Address to Report to: _____

_____

You may use this form to make your written request for the dispatch of an apprentice. Requests for dispatch must be in writing and submitted at least 72 hours in advance (excluding weekends and holidays) via first class mail, fax or email. ***Proof of submission may be required.*** *Please take note of California Code of Regulations, Title 8, § 230.1 (a) for all applicable requirements regarding apprenticeship requests and/or visit* http://www.dir.ca.gov/DAS/DASApprenticesOnPublicWorksSummaryOfRequirements.htm

Section 3:
During Construction Submittals

A. Statement of Employer Payments

B. CAC Training Fund Contributions (CAC-2 Form)

C. Statement of Non-Performance

D. Public Works Payroll Reporting From (A-1-131 Form)

E. Verification of Apprenticeship Status

Statement of Employer Payments

Date:		In Reply, Refer to Case No:	
Prime:			
Subcontractor:			
PROJECT NAME:			
PROJECT CONTRACT NO.:		County/location:	

HEALTH AND WELFARE

NAME OF PLAN _____ Address, City and Zip _____

ADMINISTRATOR _____ Address, City and Zip _____

CLASSIFICATION(S) USED	CONTRIBUTION PER CLASSIFICATION PER HOUR

CONTRIBUTIONS: WEEKLY_____ MONTHLY_____ QUARTERLY_____ ANNUALLY_____

PENSION

NAME OF PLAN _____ Address, City and Zip _____

ADMINISTRATOR _____ Address, City and Zip _____

CLASSIFICATION(S) USED	CONTRIBUTION PER CLASSIFICATION PER HOUR

CONTRIBUTIONS: WEEKLY_____ MONTHLY_____ QUARTERLY_____ ANNUALLY_____

VACATION/HOLIDAY

NAME OF PLAN _____ Address, City and Zip _____

ADMINISTRATOR _____ Address, City and Zip _____

CLASSIFICATION(S) USED	CONTRIBUTION PER CLASSIFICATION PER HOUR

CONTRIBUTIONS: WEEKLY_____ MONTHLY_____ QUARTERLY_____ ANNUALLY_____

TRAINING

NAME OF PLAN _____ Address, City and Zip _____

ADMINISTRATOR _____ Address, City and Zip _____

CLASSIFICATION(S) USED	CONTRIBUTION PER CLASSIFICATION PER HOUR

CONTRIBUTIONS: WEEKLY_____ MONTHLY_____ QUARTERLY_____ ANNUALLY_____

IF YOU USE OTHER PLANS NOT LISTED ABOVE, YOU MAY USE THE BACK OF THIS FORM TO PROVIDE THIS ADDITIONAL INFORMATION

PW 26

Division of Apprenticeship Standards (DAS)

CAC - Training Fund Contributions

You must enter all requested infomation in order to ensure successful submission and processing of your payment.
Training Fund Contributions are due on the 15th of each month.

All fields with * are required.

You must use the BUTTON on the bottom of the page to submit for an invoice coupon.
TO NAVIGATE BETWEEN FIELDS, DO NOT HIT RETURN OR ENTER KEY AFTER EACH ENTRY. USE THE TAB KEY INSTEAD.

You need to have a working printer currently connected to your computer in order to print the complete paper form in the end of this session so that you can mail it with your payment.

Training Fund Contributions Form CAC2

Date: 9/25/2014

CLEAR FORM

Contractor/Sub Contractor making contributions	Contractor	Period covered by contribution (from – to)	Jobsite Location (including County)
* Name:	* License Number:	* Period Start:	If applicable, give name of school, hospital, building, etc.
* Address: * City: * State: * ZIP:	* Contract/Project Number	* Period End: (MM/DD/YYYY)	Comments:

* Name of the submitting party:	* Submitter's Title:	* Submitter's Email:	*Submitter's Phone: e.g., (999) 999-9999

Instructions: You may want to use the keyboard TAB key to navigate the fields and the Up /\ | Down \/ ARROW keys to select a list item.

	* County of Work	* Classification [1]	* Hours (min.: 0.5; max: 9 999.99)	* Rate (min.: 0.01; max: $9.99)	Amount
*1)	Select a county	Select an occupation	**	$ **	$ 0.00
2)	Select a county	Select an occupation		$	$ 0.00
3)	Select a county	Select an occupation		$	$ 0.00
4)	Select a county	Select an occupation		$	$ 0.00
5)	Select a county	Select an occupation		$	$ 0.00
6)	Select a county	Select an occupation		$	$ 0.00
7)	Select a county	Select an occupation		$	$ 0.00
8)	Select a county	Select an occupation		$	$ 0.00

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DOCUMENT 00 73 49A

9)	Select a county	Select an occupation		$	$ 0.00
10)	Select a county	Select an occupation		$	$ 0.00
11)	Select a county	Select an occupation		$	$ 0.00
12)	Select a county	Select an occupation		$	$ 0.00
13)	Select a county	Select an occupation		$	$ 0.00
14)	Select a county	Select an occupation		$	$ 0.00
15)	Select a county	Select an occupation		$	$ 0.00
16)	Select a county	Select an occupation		$	$ 0.00
17)	Select a county	Select an occupation		$	$ 0.00
18)	Select a county	Select an occupation		$	$ 0.00
19)	Select a county	Select an occupation		$	$ 0.00
20)	Select a county	Select an occupation		$	$ 0.00

Footnote 1 – If you are unable to locate the occupation in the pull down menu, please click on this link:
http://www.dir.ca.gov/databases/das/aigstart.asp for specific information assistance.

TOTAL AMOUNT: $ 0.00

When done with some or all the entries above, please carefully review and then enter the green code you see below:

22749

Calculate Total Amount

August 2014

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TO BE TYPED ON COMPANY LETTERHEAD

STATEMENT OF NON-PERFORMANCE

Payroll # _____ Date_____

I do hereby state that no persons employed on the construction of the _____ Project, for _____
(Project Name) (Awarding Body)

Company, Contract No._____ during the payroll period commencing on the _____th day of _____, 2007 and ending on the _____th day of _____, 2007.

_____
(Company Name)

_____
(Authorized Signer)

California
Department of
Industrial Relations

PUBLIC WORKS PAYROLL REPORTING FORM

Page _____ of _____

NAME OF CONTRACTOR:
OR SUBCONTRACTOR:

CONTRACTOR'S LICENSE NO.:
SPECIALITY LICENSE NO.:

ADDRESS:

PAYROLL NO.:

FOR WEEK ENDING:

SELF-INSURED CERTIFICATE NO.:
WORKERS' COMPENSATION POLICY NO.:

PROJECT OR CONTRACT NO.:
PROJECT AND LOCATION:

(1) NAME, ADDRESS AND SOCIAL SECURITY NUMBER OF EMPLOYEE	(2) NO. OF WITH-HOLDING EXEMPTIONS	(3) WORK CLASSIFICATION	(4) DAY	M	T	W	TH	F	S	S	(5) TOTAL HOURS	(6) HOURLY RATE OF PAY	(7) GROSS AMOUNT EARNED		(8) DEDUCTIONS, CONTRIBUTIONS AND PAYMENTS							(9) NET WGS PAID FOR WEEK	(9) CHECK NO.
				DATE																			
				HOURS WORKED EACH DAY																			
			S										THIS PROJECT	ALL PROJECTS	FED. TAX	FICA (SOC. SEC.)	STATE TAX	SDI	VAC/ HOLIDAY	HEALTH & WELF.	PENSION		
			O												TRAING.	FUND ADMIN	DUES	TRAV/ SUBS.	SAVINGS	OTHER*	TOTAL DEDUC-TIONS		
			S										THIS PROJECT	ALL PROJECTS	FED. TAX	FICA (SOC. SEC.)	STATE TAX	SDI	VAC/ HOLIDAY	HEALTH & WELF.	PENSION		
			O												TRAING.	FUND ADMIN	DUES	TRAV/ SUBS.	SAVINGS	OTHER*	TOTAL DEDUC-TIONS		
			S										THIS PROJECT	ALL PROJECTS	FED. TAX	FICA (SOC. SEC.)	STATE TAX	SDI	VAC/ HOLIDAY	HEALTH & WELF.	PENSION		
			O												TRAING.	FUND ADMIN	DUES	TRAV/ SUBS.	SAVINGS	OTHER*	TOTAL DEDUC-TIONS		
			S										THIS PROJECT	ALL PROJECTS	FED. TAX	FICA (SOC. SEC.)	STATE TAX	SDI	VAC/ HOLIDAY	HEALTH & WELF.	PENSION		
			O												TRAING.	FUND ADMIN	DUES	TRAV/ SUBS.	SAVINGS	OTHER*	TOTAL DEDUC-TIONS		

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Form A-1-131 (NEW 2-80)

S = STRAIGHT TIME
O = OVERTIME
SDI = STATE DISABILITY INSURANCE

*OTHER – Any other deductions, contributions and/or payments whether or not included or required by prevailing wage determinations must be separately listed. Use extra sheet(s) if necessary

CERTIFICATION **MUST** be completed
(See reverse side)

NOTICE TO PUBLIC ENTITY

For Privacy Considerations

Fold back along dotted line prior to copying for release to general public (private persons).

(Paper Size then 8-1/2 x 11 inches)

- - - -

Apprentice certification

Apprenticeship certification for public works

Enter search string (LLLLF9999) here Search

How to compile the search string:

The search string is a total of nine letters and numbers (no characters ', - , etc): the first four letters of the last name (use spaces to make four letters if the last name is shorter than four letters), the first letter of the first name and the last four digits of the social security number (LLLLF9999). Letters can be entered as lower or upper case.

Examples:

Uncle Sam ssn 123-45-6789 would be entered as Sam U6789
Goddess Minerva ssn 123-45-5555 would be entered as MineG5555
Richard Al-Ham ssn 111-44-1111 would be entered as AlhaR1111
Robert O'Brian ssn 111-22-3333 would be entered as OBriR3333
James McHenry ssn 555-66-1234 might be entered as McHeJ1234 or Mc HJ1234

If you cannot find the individual you are looking for, complete the certifications you have and see the notes below.

If a search string that was entered does not match with any apprentices in the Division of Apprenticeship Standards (DAS) database, this could be due to any of the following:

1. Not a registered apprentice.
2. The submitted search string does not match to DAS records (either the database has the wrong search criteria or you have the wrong search criteria).
3. The apprentice agreement has not been submitted to DAS or has not been entered into the database (agreements must be submitted within 30 days of the date that the apprentice signed the agreement).

If you believe that the apprentice should be reported as registered and is not; please contact your local office of the Division of Apprenticeship Standards.

Division of Apprenticeship Standards(DAS)

Quick Links

Become an apprentice
Find an apprenticeship program
Find a registered apprentice
Train employees through apprenticeship
Program sponsors
Use apprentices on public works projects
I built it!
Apprenticeship Council meetings
DIR Laws and Regulations
Veterans

About DAS

About Us (Overview of DAS)
Contact
Locations

DAS Home

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DAVILLIER-SLOAN, INC.
LABOR MANAGEMENT CONSULTANTS

Section 4:
Closeout

This form must be submitted to DSI
during project/program closeout

A. Contractor Affidavit

Contractor Affidavit

Contract # _____

1. I am the _____(owner, officer, partner) of _____(Company) who performed work on the _____(Project) in the classification (s) of _____.
   The labor performed by these workers can best be described by _____.

2. During the payroll periods commencing on _____ and ending on _____ all persons employed by my company on this project have been paid the specified prevailing rate of per diem wages for the specified craft or classification pursuant to Labor Code Section 1771[1].

3. The apprenticeship committee (s) either denied or failed to respond to our request for the dispatch of apprentices, and therefore all workers were classified as journeyman

Or

4. Apprentice (s) worked a total of _____ hours and _____ journeyman worked a total of _____ hours establishing an apprentice \ journeyman ratio in hours of _____ to _____.

Or

5. Apprentices were employed in accordance with the DAS exemption that required one apprentice for every five journeyman employed on each day of the contract.

Executed this ____day of _____ 20___, at _____, California.

_____
Signature

[1] Except for public works project of one thousand dollars ($1000) or less , not less than the general prevailing rate of per diem wages for work of a similar character in the locality in which the public work is performed, and not less than the general prevailing rate of per diem wages for holiday and overtime work fixed as provided in this chapter, shall be paid to all workers employed on public works.

EXHIBIT A (Letter of Assent)

PROJECT STABILIZATION/COMMUNITY BENEFITS AGREEMENT

for the

COUNTY OF ALAMEDA
CONTRACTOR AGREEMENT TO BE BOUND

The undersigned, as a Contractor or Subcontractor (CONTRACTOR) on the County of Alameda, (hereinafter PROJECT), for and in consideration of the award to it of a contract to perform work on said PROJECTS, and in further consideration of the mutual promises made in the "Project Stabilization/Community Benefits Agreement for the County of Alameda Project" (hereinafter AGREEMENT), a copy of which was received and is acknowledged, hereby:

(1) Accepts and agrees to be bound by the terms and conditions of the AGREEMENT, together with any and all amendments and supplements now existing or which are later made thereto:

(2) The CONTRACTOR agrees to be bound by the legally established local trust agreements as set forth in Article 14 of this AGREEMENT.

(3) The CONTRACTOR authorizes the parties to such local trust agreements to appoint trustees and successor trustees to administer the trust funds and hereby ratifies and accepts the trustees so appointed as if made by the CONTRACTOR;

(4) Certifies that it has no commitments or agreements which would preclude its full and complete compliance with the terms and conditions of said AGREEMENT.

(5) Agrees to secure from any CONTRACTORS (as defined in said AGREEMENT) which is or becomes a Subcontractor (of any tier) to it, a duly executed Agreement to be Bound in form identical to this document.

Dated: _____

_____
(Name of Contractor)

_____
(Name of Prime Contractor or Higher Level Subcontractor)

_____
(Authorized Officer & Title)

CA Number _____

_____
(Address)

Contract Or Project #_____

_____
(Phone) (Fax)

DOCUMENT 00 73 49B

FOR INFORMATION ONLY

PROJECT STABILIZATION/COMMUNITY BENEFITS AGREEMENT

for the

COUNTY OF ALAMEDA

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PREAMBLE

This Agreement is made and entered into on this ____ day of _____ 2013, by and between the County of Alameda ("County") together with Contractors and/or subcontractors, who shall subsequently become signatory to this Agreement by signing the "Contractor Agreement To Be Bound" (Exhibit A), ("Contractors"), the Building and Construction Trades Council of Alameda County, AFL-CIO ("Council") and the Local Unions signatory hereto, all in their behalf and in behalf of the various Local Unions involved, ("Union(s)") for the construction of all Covered Projects ("Covered Projects").

Recitals

WHEREAS, the Projects described in this Agreement have been identified by the County as those in which a Project Stabilization/Community Benefits Agreement would benefit the County; and

WHEREAS, the Contractors will be engaged in construction of the project; and

WHEREAS, a skilled labor pool represented by Building Trades Unions will be required to complete the work involved; and

WHEREAS, the Building Trades Unions agree to cooperate in every way possible with employees of the Contractors; and

WHEREAS, the parties to this Agreement mutually agree that safety, quality, productivity and labor harmony are primary goals; and

WHEREAS, the County desires to provide, enhance and encourage construction training and employment opportunities for Alameda County residents and small business enterprises within the County through apprentice and pre-apprentice programs.; and

WHEREAS, the County also desires to use this Agreement as a vehicle for building the capacity of Alameda County residents and businesses and to maximize their potential to successfully participate in other large scale projects; and

WHEREAS, the parties recognize the need for safe, efficient and speedy construction in order to reduce unnecessary delays and result in timely completion of the project; and

WHEREAS, the parties desire to mutually establish and stabilize wages, hours and working conditions for the employees employed on the project by the Contractors, and further to encourage close cooperation to achieve a satisfactory, continuous and harmonious relationship between the parties to this Agreement;

WHEREAS, the County of Alameda's mission is to enrich the lives of all residents through visionary policies and accessible, responsible and effective services and historically the County

has supported contracting outreach programs that recognize the economic and workforce development potential of capital construction projects on government owned facilities; and

WHEREAS, the Parties recognize that disadvantaged individuals, families, and communities within the county experience high unemployment and are also often recipients of County services, and that these disadvantaged populations may economically benefit through participation in local hire, apprenticeship and pre-apprenticeship programs; and

WHEREAS, the Union(s), Contractors, subcontractors, and the County wish to insure labor peace at the Covered Project sites devoid of any disruption that could jeopardize the schedule and timeliness of the construction process, where both Contractors that are signatory to collective bargaining agreements of the Union(s) are supervising employees that are members of the Union(s) and where Contractors that are not Signatory to collective bargaining agreements are supervising employees;

NOW THEREFORE, the parties, in consideration of the mutual promises and covenants herein contained, mutually agree as follows:

ARTICLE 1

DEFINITIONS

1.1 For purposes of this Agreement, the following terms will have the following meanings:

"Acceptance" shall mean action by the County notifying Contractor and other entities of Completion, as required by and in accordance with contract terms and relevant applicable statutes.

"Agreement" shall mean this Project Stabilization/Community Benefit Agreement.

"Alternative Employees" shall mean an employee whose services have been obtained from other than the Union referral facilities as permitted in Section 19.6 of this Agreement.

"Apprentice" shall mean a person enrolled in a State approved apprenticeship training program administered by a Joint Labor-Management Apprenticeship Training Committee (JATC).

"Completion" means that the work of Contractors' is completed, as follows:

1. The occupation, beneficial use, and enjoyment of a work of improvement, excluding any operation only for testing, startup, or commissioning, by the public agency, or its agent, accompanied by a cessation of labor on the work of improvement.
2. The acceptance by the public agency, or its agent, of the work of improvement.

"Contractors" means all contractors and subcontractors at all tiers, any individual, firm, partnership or corporation, or combination thereof, including joint ventures, which is an

independent business enterprise and has entered into a contract with the County or any of its contractors or subcontractors at any tier, with respect to the construction work covered by this Agreement and necessary for the project or any part thereof, including construction building material delivery (if the material is for direct incorporation) and removal truckers, trucking companies and trucking brokers, including the operating of construction equipment, performance of labor and/or installation of materials.

"Coordinator" shall mean the company or individual designated or retained by the County to administer this Agreement.

"Core Employee" shall mean an individual meeting the criteria listed in Section 19.1.1-19.1.5.

"Council" shall mean the Building and Construction Trades Council of Alameda County.

"County" shall mean the County of Alameda acting by and through its Board of Supervisors, Agency and Department heads and administrative staff.

"Covered Projects" and "Projects" means projects covered by the Agreement.

"Covered Work" means work done on the project and subject to the provisions of this Agreement.

"Disadvantaged Population" shall mean those Residents of Alameda County who meet at least one of the following criteria: household income below 50% of the Alameda County median, non-minor dependent youth (AB-12 youth – emancipated foster youth), homeless, welfare recipients, have a history of involvement with the criminal justice system, are unemployed, or a single parent.

"Emergency Work" shall mean those projects undertaken when an immediate or imminent critical impact to a facility or to the ability to provide essential services is likely within 30 days should no further action be taken, or in circumstances where mandatory environmental, health and/or safety requirements will be violated without said project.

"General Prevailing Wage Determination" shall mean the decisions made by the Director of the California Department of Industrial Relations (DIR) establishing a journeyman craft or classification's prevailing wage determination, holiday, advisory scope of work, or travel and subsistence provision.

"Local Hiring Goals" shall mean the Resident and Apprentice hiring goals set forth in Article 17 and Article 18 of this Agreement.

"Local Hiring Program" shall mean the program set forth in Article 17 and Article 18 of this Agreement intended to achieve the inclusion of County Residents in the employment and apprenticeship opportunities created by the Covered Work.

"Master Labor Agreement" or "MLA" shall mean the collective bargaining agreement of each craft Union that is Signatory to this Agreement.

"New Apprentice" shall mean an Alameda County Resident who on the date that such individual is hired or assigned to perform the applicable work, is newly enrolled (less than one year) in a labor-management apprenticeship program that is currently registered with the State of California's Division of Apprenticeship Standards.

"Owner Operator" shall mean a sole individual that owns and drives/operates a maximum of one unit and who is employed in the movement or transportation of materials or goods of another. The owner operator shall be carried on the payroll of the entity that employs or otherwise uses the Owner/Operator. The Owner/Operator shall direct a maximum of one unit which he or she shall drive themselves. In addition the owner operator must provide documentation of insurance, a business license, and a valid motor carrier permit issued solely in their name.

"Post Disaster Work" shall mean County approved construction projects consistent with Post Disaster response and recovery efforts per the California Government Code Section 20168 where the public interest and necessity demand immediate expenditure of public funds to safeguard life, health, or property following a local, state or federally declared disaster per the Stafford Act.

"Project Manager" shall mean the person or persons designated by the County of Alameda Board of Supervisors to act on behalf of the County in all matters involving or related to individual Covered Projects..

"Resident" shall mean an individual who has lived or resided in Alameda County for a period of not less than thirty (30) calendar days prior to the date of dispatch/referral of that individual by the Union to a Contractor performing work on the project or for a period of not less than thirty (30) calendar days prior to applying for work or inclusion in the Local Hire Program if the individual is an Alternative Employee, a Core Employee, a member of a Disadvantaged Population, or a Local Hire Program applicant.

"Signatory" shall mean those Unions who have through their officers and or agents executed this Agreement.

"Sole Proprietor" shall mean an owner who will self-perform the designated Covered Project Work without hiring field support staff for the Project.

"Trust Agreements" shall mean the agreements between Unions and employers and or employer associations to govern trust funds contributed on behalf of covered workers for benefits for said workers.

"Union" or "Unions" shall mean the Building and Construction Trades Council of Alameda County and its affiliated local unions Signatory to the Agreement, acting on their own behalf or on behalf of their respective affiliates and member organizations.

ARTICLE 2

PURPOSE

2.1 The purposes of this Agreement are to promote efficient construction operations on the Projects, to insure an adequate supply of skilled craftspeople and to provide for peaceful, efficient and binding procedures for settling labor disputes. In so doing, the parties to this Agreement establish the foundation to promote the public interest, to provide a safe work place, to assure high quality construction, to ensure uninterrupted construction Projects, and to secure optimum productivity, on-schedule performance and County satisfaction.

2.2 It is the intent of the parties to set out uniform and fair working conditions for the efficient completion of the Projects, maintain harmonious labor/management relations and eliminate strikes, lockouts and other delays.

2.3 The parties agree that one of the primary purposes of this Agreement is to avoid the tensions that might arise on the Projects if union and nonunion workers of different employers were to work side by side on the Projects thereby leading to labor disputes that could delay completion of the Projects.

2.4 This Agreement is entered into pursuant to and consistent with California Public Contract Code ("PCC") Sections 2500 through 2502. PCC Section 2500(a)(3) requires a public entity PLA to include an agreed-upon protocol concerning drug testing for workers employed on the Projects, as set forth in Article 16.3.

ARTICLE 3

SCOPE OF AGREEMENT

3.1 The parties agree that this Agreement will cover all projects undertaken by the County of Alameda with a construction value of $1 million or more. In addition, the Agreement will cover all projects with a construction value of $1 million or more which are undertaken on behalf of the County or in circumstances where County is executing projects for Special Districts,. The parties further agree that the Board of Supervisors may at their discretion elect to include any project with a value less than $1 million under the terms of this Agreement.

3.2 This Agreement covers all on-site construction, fabrication, demolition, alteration, painting or repair of buildings, structures, landscaping, temporary fencing and other work and related activities that are within the craft jurisdiction of one of the Union(s) and that is part of the work, including site preparation, survey work, and all construction, demolition or improvements required to be performed as a condition of approval by the County.

3.3 This Agreement shall apply only to construction/craft employees, performing work on projects represented by the Signatory Unions, and shall not apply to Contractors' supervisors, technical or non-manual employees including, but not limited to, executives, engineers, office and clerical employees, drafters, architects, supervisors, timekeepers, messengers, guards, other employees above the classification of general foreman, inspectors, material testers, and/or x-ray technicians, except to the extent that such inspectors, material testers, and/or x-ray technicians are customarily covered by the MLA and as to which classification a prevailing wage determination has been published.

3.4 There shall be no limitation or restriction upon the choice of materials or upon the full use and installation of equipment, machinery, package units, factory pre-cast, prefabricated or preassembled materials, tools or other labor-saving devices. The lawful fabrication provisions of the appropriate national or local agreements shall be applicable. The covered projects include work necessary for the covered projects and/or in temporary yards or areas adjacent to and dedicated to the covered projects, and at any batch plant(s) constructed or used solely to supply materials to the Covered Projects, when those sites or processes are dedicated exclusively to the covered projects.

3.5 This Agreement covers all on-site fabrication work over which the County or Contractors possess the right of control (including work done for the covered projects in any temporary yard or area established for the Covered Projects). Additionally, any offsite work, including fabrication, necessary for the Covered Projects defined herein, that is lawfully covered by a current MLA or local addenda to a National Agreement of the applicable Union(s) that is in effect as of the execution of this Agreement shall be considered covered work under this Agreement.

3.6 This Agreement shall apply to any start-up, calibration, performance testing, repair, maintenance, operational revisions to systems and/or subsystems performed up to 9 months after Completion by the Contractors. It is understood the County reserves the right to perform any start-up, operation, repair, maintenance or revision of equipment or systems with employees of the County. If required, Contractor's personnel may make a final check and may direct their staff on site to make any necessary repairs to protect the terms of a manufacturer's guarantee or warranty of a piece of equipment.

3.7 The on-site installation or application of all items shall be performed by the craft having jurisdiction over such work as set forth under the provisions of this Agreement; provided, however, it is recognized that installation of specialty items which may be furnished by the County or a Contractor shall be performed by construction persons of the vendor or other companies where necessary to protect a manufacturer's warranty. The issue of whether it is necessary to use construction persons of the vendor or other companies to protect the manufacturer's warranty shall be subject to the grievance and arbitration clause of this Agreement.

3.8 It is recognized by the parties to this Agreement that the Coordinator designated in Article 9 below, and Contractors are acting only on behalf of said Coordinator and

Contractors, and said Coordinator and Contractors have no authority, either expressed, implied, actual, apparent or ostensible, to speak for or bind the County.

3.9 It is expressly agreed and understood that the County retains the right and ability to meet all competitive bidding requirements of public contracting law and to select the lowest responsive and responsible bidder who provides the County with best value within a stipulated sum regardless of union signatory status. Further, the County may, at its sole discretion, end, delay, and/or suspend any or all portions of the work and may combine, consolidate, modify and/or not build any one or more portions of work covered by this Agreement at any time.

3.10 It is expressly agreed and understood by the parties hereto that the County shall retain the right at all times to perform and/or subcontract all portions of the construction and related work on project sites not covered by this Agreement.

3.11 It is expressly agreed and understood by the parties hereto that the County shall have the right to purchase material and equipment from any source and the craftspersons will handle and install such material and equipment, subject to the requirements of Section 3.6.

3.12 Without limiting the foregoing, items specifically excluded from the scope of this Agreement include the following:

3.12.1 The operation of equipment and machinery owned or controlled by the County and its subcontractors and not directly related to construction of covered projects;

3.12.2 All employees of any Contractor or any other consultant of the County not performing construction craft labor within the scope of this Agreement;

3.12.3 Any work performed on or near or leading to or on to the site of work covered by this Agreement and undertaken by state, county, city or other governmental bodies, or their Contractors, or by public utilities or their Contractors, and/or by the County or its Contractors (for work which is not part of the scope of this Agreement).

3.12.4 Off-site maintenance of leased equipment and on-site supervision of such work;

3.12.5 Non-construction support services contracted by the County or any Contractor in connection with covered projects;

3.12.6 All work by employees of the County;

3.12.7 Operations or maintenance work executed by the County;

3.12.8. All work on covered projects under any contract entered into prior to the date of this Agreement;

3.12.9. All warranty functions, warranty work, corrective work, repair and maintenance work on purchased equipment performed by manufacturers' representatives or vendors after Completion and acceptance of any covered projects by the County; and

3.12.10 All Post Disaster and Emergency Work as defined in Article 1.

3.13 The Council shall assist the County and its contractors in encouraging and soliciting subcontractors in bidding on all covered projects.

ARTICLE 4

RELATIONSHIP BETWEEN PARTIES

4.1 This Agreement shall only be binding on the Signatory parties hereto, and shall not apply to parents, affiliates, subsidiaries, or other divisions of the Coordinator and Signatory Contractors unless signed by such parent, affiliate, subsidiary, or other division of such company.

4.2 Each Contractor shall alone be liable and responsible for its own individual acts and conduct and for any breach or alleged breach of this Agreement. Any alleged breach of this Agreement by a Contractor or any dispute between the Signatory Union and the Contractor respecting compliance with the terms of this Agreement, shall not affect the rights, liabilities, obligations and duties between the signatory Union and each other Contractor party to this Agreement.

4.3 It is mutually agreed by the parties that any liability by a Signatory Union(s) to this Agreement shall be several and not joint. Any alleged breach of this Agreement by a signatory Union shall not affect the rights, liabilities, obligations and duties between the Signatory Contractors and the other Unions party to this Agreement.

ARTICLE 5

ROLES AND RESPONSIBILITIES

SUBCONTRACTS

5.1 Each Contractor, which includes all subcontractors of any tier, including trucking entities performing Covered Work on the Projects, agrees that neither it nor any of its subcontractors will subcontract any work to be done on the Project except to a person, firm, or corporation who is or becomes party to this Agreement by signing the Agreement

to be Bound attached to this Agreement as Exhibit "A". All Contractors performing Covered Work on the Project shall, as a condition to performing work on the Project, become Signatory to and perform all work under the terms of this Agreement.

5.2 A Contractor includes any person, firm or corporation who agrees under contract with another Contractor of any tier, to perform on the Project any part or portion of the construction work covered by the prime contract, including the operating of construction equipment, performance of labor and/or installation of materials.

5.3 Notwithstanding any other provisions of this Agreement, the Contractor, as appropriate, in conformance with paragraph 3.7 of this Agreement shall have the absolute right to award contracts or subcontracts for this Project notwithstanding the existence or nonexistence of any collective bargaining agreements between the prospective Contractor and any Union party, and provided that such Contractor is willing, ready and able to comply with this Project Stabilization/Community Benefits Agreement and shall execute a Letter of Assent (in the form attached as Exhibit A), should such Contractor be awarded work covered by this Agreement.

5.4 The furnishing of supplies, equipment or materials which are stockpiled for later use shall in no case be considered subcontracting and shall be covered to the extent permitted by law. The delivery of ready-mix, asphalt, aggregate, sand or other fill material which are directly incorporated into the construction process as well as the off-hauling of debris and excess fill material and/or mud, shall be covered by the terms and conditions of this Agreement.

5.5 Each Contractor with a contract directly with the County has the primary obligation for performance of all conditions of this Agreement, including the performance of all of that Contractor's subcontractors. This obligation cannot be relieved, evaded or diminished by subcontracting. Should a Contractor elect to subcontract, that Contractor shall continue to have such primary obligation.

5.6 Each Contractor, which includes all subcontractors of any tier performing work on the Project, shall give written notice to the Union(s) of any subcontract involving the performance of work covered by this Agreement within either five (5) business days of entering such subcontract or before the subcontractor commences work on the Project, whichever occurs first. Such notice shall specify the name and address of the subcontractor, the California State License Board license number of the Contractors and the scope of work to be performed. Written notice at a Pre-Job Conference shall be deemed written notice under this provision only for those subcontractors listed at the Pre-Job Conference.

5.7 Signatory Contractors:

5.7.1 With regard to any Contractor that is independently signed to any Master Labor Agreement, this Agreement shall in no way supersede or prevent the enforcement of any subcontracting clause contained in such MLA, except as specifically set

forth in Section 5.7.2 below. Any such subcontracting clause in a MLA shall remain and be fully enforceable between each craft union and its signatory Contractors, and no provision of this Agreement shall be interpreted and/or applied in any manner that would give this Agreement precedence over subcontracting obligations and restrictions that exist between craft unions and their respective signatory Contractors under a MLA, except as specifically set forth in subsection 5.7.2 below.

5.7.2 If a craft union ("aggrieved union") believes that an assignment of work for this Project has been made improperly by a Contractor or subcontractor, even if that assignment was as a result of another craft union's successful enforcement of the subcontracting clause in its MLA, as permitted by subsection 5.7.1 above, the aggrieved union may submit a claim under the jurisdictional resolution procedure contained in Article 6 of this Agreement, and the decision rendered as part of that process shall be enforceable to require the Contractor or subcontractor that made the work assignment to assign that work prospectively to the aggrieved union. An award made to a craft union under the subcontracting clause of its MLA, as permitted pursuant to subsection 5.7.1 above, shall be valid and fully enforceable by that craft union unless it conflicts with a jurisdictional award made pursuant to this Agreement. If the award made under the MLA conflicts with the jurisdictional award, the award of damages under the former shall be null and void *ab initio*.

ARTICLE 6

WORK ASSIGNMENTS AND JURISDICTIONAL DISPUTES

6.1 The following language is specifically agreed to for the resolution of any Jurisdictional Disputes which may arise during the construction which is specifically covered by this Agreement. This agreement regarding resolution of jurisdictional disputes shall apply only to such disputes arising on Covered Projects.

6.2 There will be no strikes, no work stoppages, no picketing, sympathy strikes, slow downs or other interferences with the work because of jurisdictional disputes between signatory Unions. Individuals violating this section shall be subject to immediate discharge.

6.3 The assignment of Covered Work will be solely the responsibility of the Contractor performing the work involved; and such work assignments will be in accordance with the Plan for the Settlement of Jurisdictional Disputes in the Construction Industry (the "Plan") or any successor Plan.

6.4 All jurisdictional disputes on this Project between or among the Building and Construction Trades Unions and the Contractors, parties to this Agreement, shall be settled and adjusted according to the present Plan established by the Building and Construction Trades Department, or any other plan or method of procedure that may be

adopted in the future by the Building and Construction Trades Department. Decisions rendered shall be final, binding and conclusive on the Contractor and Union parties to this Agreement.

6.4.1 For the convenience of the parties, and in recognition of the expense of travel between Northern California and Washington, D.C., at the request of any party to a jurisdictional dispute under this Agreement, an Arbitrator shall be chosen by the procedures specified in Article V, Section 5, of the Plan from a list composed of John Kagel, Thomas Angelo, Robert Hirsch and Thomas Pagan, and the Arbitrator's hearing on the dispute shall be held at the applicable Building and Construction Trades Council. All other procedures shall be as specified in the Plan.

6.5 All jurisdictional disputes shall be resolved without the occurrence of any strike, work stoppage, or slow-down of any nature, and the Contractor's assignment shall be adhered to until the dispute is resolved. Individuals violating this section shall be subject to immediate discharge.

6.6 Each Contractor shall conduct a Pre-Job Conference with the Council prior to commencing Covered Work. The Prime Contractor, the County and the Coordinator will be advised in advance of all such conferences and may participate if they wish. Pre-job conferences for different Contractors may be held together.

ARTICLE 7

PRE-JOB CONFERENCE

7.1 A mandatory Pre-Job Conference with each Contractor will be held prior to the commencement of work to establish the scope of work in each Contractor's contract. When a contract has been let to Contractors covered by this Agreement, a Pre-Job Conference and/or Mark-Up Meeting shall be required and shall be held. The parties may mutually agree to waive the requirement to hold a Pre-Job Conference and/or Mark-Up Meeting for any particular contract or contractor. All meetings shall be held at the offices of the Alameda County Building and Construction Trades Council.

7.2 The Contractor performing the work shall have the responsibility for making work assignments in accordance with Section 6.3 of this Agreement, and will be required to bring relevant plans, specifications, and blueprints to the meeting, as requested by Union.

7.3 The Coordinator will schedule and attend all Pre-Job and Mark-Up Meetings and participate in discussions as they pertain to the terms and conditions of this Agreement.

ARTICLE 8

JOINT ADMINISTRATIVE COMMITTEE MEETINGS

8.1 The parties to this Agreement will form a five person Joint Administrative Committee (JAC). The Committee will be comprised of two (2) representatives selected by the Council, two (2) representatives selected by the County, and one (1) community representative, nominated by the Board of Supervisors and agreeable to the Council. The parties shall appoint an alternate. The JAC meetings will be convened by the Coordinator and chaired jointly by a representative of the Council and the County, and a quorum shall be three members, including at least one (1) from the County and one (1) from the Council. The purpose of these meetings is to promote harmonious labor/management relations, ensure adequate communications and advance the proficiency and efficiency of the employees and the Contractors for the Covered Projects. The Committee shall also monitor compliance with Article 17 and Article 18. These meetings will also include discussion of the scheduling, productivity and safety of work performed for the Covered Projects.

8.2 The JAC shall appoint a Joint Administrative Subcommittee, comprised of one (1) representative of the County and, one (1) representative of the Council for the purpose of convening to confer in an attempt to resolve any grievance that has been filed consistent with Article 23. This Subcommittee shall meet as required to resolve grievances by consensus vote. If no resolution can be mutually agreed upon, the grievance shall proceed to the grievance procedure outlined in Article 23, Step 4.

8.3 The JAC shall appoint a Joint Administrative Subcommittee, comprised of one (1) representative of the County, one (1) representative of the Council and one (1) representative of a community based organization to resolve any grievance filed consistent with Article 17 or Article 18.

8.4 The JAC shall have the initial authority to investigate and resolve by consensus vote any allegation of violations of Articles 19 and 20. If the JAC cannot resolve the allegations, then any signatory party may take the matter directly to final and binding arbitration as described in Article 23.

8.5 JAC Meetings

8.5.1 The JAC will meet monthly at the call of either chair.

8.5.2 The Coordinator will establish agenda topics with input from the Committee and send notices of meetings with the agenda in advance of the meetings.

8.5.3 The JAC will receive reports and consider work progress and practices, local hire utilization, Disadvantaged Population utilization, pre-apprentice recruitment, training and referral, and apprentice development and utilization.

8.5.4 The Coordinator and the Contractors shall report progress on these issues and provide ongoing workforce projections for their work.

8.6 Joint Administrative Subcommittee Meetings

8.6.1 Both Joint Administrative Subcommittees will meet as required to address grievances/disputes.

8.6.2 The Coordinator will establish agenda topics with input from the Subcommittee and send notices of meetings with the agenda in advance of the meetings.

ARTICLE 9

COORDINATOR

9.1 The County will designate a Coordinator, who will be responsible for the administration and application of this Agreement.

9.2 The Coordinator shall endeavor to facilitate harmonious relations between the Contractors and Unions Signatory hereto and will conduct the Joint Administrative Committee meeting at the request of either joint chair referred to in Article 8 above. The Coordinator shall not be responsible for the acts of the Contractors or Unions Signatory hereto, and will not be a party to any arbitration or litigation arising out of this Agreement.

ARTICLE 10

UNION RECOGNITION AND REPRESENTATION

10.1 The Contractors recognize the Union(s) Signatory hereto as the sole and exclusive collective bargaining representatives for all craft employees on the Project.

10.2 All employees who are employed by the Contractors shall, as a condition of employment, on or before the eighth (8^{th}) day of consecutive or cumulative employment for a construction contract subject to this Agreement, be responsible for the payment of the applicable monthly working dues and any associated fees uniformly required for union membership in the Union(s). However, there is nothing in this Agreement that would prevent non-union employees from joining the Union(s).

10.3 Authorized representatives of the Union(s) shall have access to the Project site at all times when work is being, has been or will be performed. Such representatives shall comply with the reasonable visitor safety and security rules established for the Project. Access for Union(s) representatives will not be unduly restricted.

10.4 The treatment and payment of stewards shall be in accordance with the applicable MLA.

ARTICLE 11

NO STRIKES - NO LOCKOUTS

11.1 During the life of this Agreement, the Unions and their members, agents, representatives and employees shall not incite, encourage, condone or participate in any strike, walkout, slowdown, sit-down, stay-in, boycott, wobble, sympathy strike, picketing or other work stoppage or hand-billing on the Covered Projects for any cause whatsoever, or any other type of interference of any kind, coercive or otherwise, and it is expressly agreed that any such action is a violation of this Agreement.

11.1.1 Withholding of employees for failure of a Contractor to meet its weekly payroll is not a violation of this Article 11; however, the Union shall submit documentation of the failure to pay to the Coordinator and shall give the affected Contractor and the Coordinator written notice seventy-two (72) hours prior to the withholding of employees.

11.1.2 Should a Contractor performing work for this Project be delinquent in the payment of Trust Fund contributions required under this Agreement with respect to employees represented by the Union, the Union may request, that the Contractor issue joint checks payable to the Contractor and the appropriate employee benefit Trust Fund until such delinquencies are satisfied. Any Trust Fund claiming that a Contractor is delinquent in its fringe benefit contributions to the funds will provide written notice of the alleged delinquency to the affected Contractor, with copies to the General Contractor, the Coordinator and the County. The notice will indicate the amount of delinquency asserted and the period that the delinquency covers. It is agreed, however, with respect to Contractors delinquent in trust or benefit contribution payments, that nothing in this Agreement shall affect normal contract remedies available under the local collective bargaining agreements. If the Contractor is delinquent in the payment of Trust Fund contributions for covered work performed for this Project, the Contractor agrees that the affected Trust Fund may place the County on notice of such delinquencies and the Contractor further agrees that the County may issue joint checks to the Contractor and the Trust Fund until the delinquency is satisfied.

11.2 Expiration of Local and Other Applicable Agreements. It is specifically agreed that there shall be no strike, sympathy strike, picketing, lockout, slowdown, withholding of work, refusal to work, walk-off, sick-out, sit-down, stand-in, wobble, boycott or other work stoppage of any kind as a result of the expiration of any local, regional or other applicable labor agreement having application on the Project and/or failure of the parties to that agreement to reach a new contract. If a Master Labor Agreement between a Contractor and the Union expires before the Contractor completes the performance of a construction contract and the Union or Contractor gives notice of demands for a new or modified Master Labor Agreement, the Union agrees that it will not strike or withhold labor from the Contractor for said contract for work covered under this Agreement and the Union

and the Contractor agree that the expired collective bargaining agreement shall continue in full force and effect for work covered under this Agreement until a new or modified Master Labor Agreement is reached between the Union and Contractor. If the Union and Contractors agree to an interim agreement that will apply until a new Master Labor Agreement is reached, then, the Contractor may work under the terms of the interim agreement until a new or modified Master Labor Agreement is reached between the Union and Contractor. If the new or modified Master Labor Agreement reached between the Union and Contractor provides that any terms of compensation of the Master Agreement shall be retroactive, the Contractor agrees to comply with any retroactive terms of the new or modified Master Labor Agreement to its effective date which is applicable to employees who performed work for the project during the interim period. Such compliance shall occur within seven (7) days after notification by the Union.

11.3 In consideration of the foregoing, the Contractor shall not incite, encourage or participate in any lockout or cause to be locked out any employee covered under the provisions of this Agreement. The term "lockout" does not refer to the discharge, termination or layoff of employees by the Contractor for any reasons in the exercise of its rights as set forth in any provision of this Agreement, nor does "lockout" include the County's or Contractor's decision to terminate or suspend work for the site or any portion thereof for any reason.

11.4 Any employee or employees inciting, encouraging or participating in any strike, slowdown, picketing, sympathy strike or other activity in violation of this Agreement may be subject to immediate discharge and the procedure under this Article 11, if invoked.

11.5 Upon written or electronic mail notice of a violation to the Local and/or International Union offices, the Union and its officers shall take immediate action and will use its (their) best efforts to prevent, end or avert any such aforementioned activity or the threat thereof by any of its officers, members, representatives or employees, either individually or collectively, including but not limited to, publicly disavowing any such action and ordering all such officers, representatives, employees or members who participate in such unauthorized activity to cease and desist from same immediately and to return to work and comply with its orders. The Contractor shall have the right, in the event of a work stoppage by the Union to replace the employees represented by the Union in violation of this Agreement. Nothing in this Agreement shall be construed to limit or restrict the right of any of the parties to this Agreement to pursue fully any and all remedies available under law in the event of a violation of this Article 11.

11.6 Any party to this Agreement may institute the following binding arbitration procedure when such a breach is alleged. In the event a party institutes this procedure, arbitration shall be mandatory.

11.6.1 The party invoking this procedure shall immediately notify Robert Hirsch, who the parties agree shall be the permanent Arbitrator under this procedure. Thomas Angelo shall serve as alternate in the event that the permanent Arbitrator is unavailable at any time. Notice to the Arbitrator shall be by the most expeditious

means available, with written notice by email or similar means to the party alleged to be in violation and the involved Union General President.

11.6.2 Upon receipt of said notice the Arbitrator named above or the alternate shall designate a place for, schedule and hold a hearing within twenty-four (24) hours.

11.6.3 The Arbitrator shall notify the parties by electronic mail or similar means of the place and time chosen for the session. A failure of any party or parties to attend said hearing shall not delay the hearing of evidence or issuance of an award by the Arbitrator.

11.6.4 The sole issue at the hearing shall be whether or not a violation of this Article has in fact occurred, and the Arbitrator shall have no authority to consider any matter in justification, explanation or mitigation of such violation or to award damages, which issue is reserved for court or other arbitration proceedings, if any. The award shall be issued in writing within three (3) hours after the close of the hearing and may be issued without a written opinion. If any party desires a written opinion, one shall be issued within fifteen (15) days, but its issuance shall not delay compliance with, or enforcement of, the award. The Arbitrator shall order cessation of the violation of this Article and other appropriate relief, and such award shall be served on all parties by hand or registered mail upon issuance.

11.6.5 Liquidated Damages. A party found to have violated the provisions of the No Strike-No Lockout section in this Article 11 shall cease such violation within eight (8) hours of the award of the Arbitrator. Should the violation continue past eight (8) hours, the party in violation shall pay to the affected party as liquidated damages either the actual damages incurred or the sum of ten thousand dollars ($10,000.00) per shift, or portion thereof, whichever is greater, until such violation is ceased. The Arbitrator shall retain jurisdiction to resolve any disputes regarding the liquidated damages claimed under this section.

11.6.6 The award shall be final, binding and non-reviewable as to the merits. A judgment of any court of competent jurisdiction shall be entered upon the award, which may be enforced by any such court, upon the filing of this Agreement and all other relevant documents referred to hereinabove in the following manner. Electronic mail or similar notice of the filing of such enforcement proceedings shall be given to the other party. In the proceeding to obtain a temporary order enforcing the Arbitrator's award as issued under subsection 11.6.4 of this Article, all parties waive the right to a hearing and agree that such proceedings may be ex parte. Such agreement does not waive any party's right to participate in a hearing for a final order of enforcement. The Court's order or orders enforcing the Arbitrator's award shall be served on all parties by hand or by delivery to their last known address or by registered mail.

11.6.7 Any rights created by statute or law governing arbitration or injunction proceedings inconsistent with the above procedure, or which interfere with compliance therewith, are hereby waived by the parties to whom they accrued.

11.6.8 The costs of the arbitration, including the fee and expenses of the Arbitrator, shall be borne equally by the affected Union(s) and the affected Contractors.

11.6.9 The procedures contained in this Section 11.6 shall be applicable only to alleged violations of this Article. Discharge or discipline of employees for violation of this Article shall be subject to the grievance and arbitration procedures of Article 23.

ARTICLE 12

MANAGEMENT RIGHTS

12.1 The Contractor retains full and exclusive authority for the management of their work forces for all work performed under this Agreement. This authority includes, but is not limited to, the right to:

12.1.1 Plan, direct and control the operation of all the work.

12.1.2 Decide the number and types of employees required to perform the work safely and efficiently. The lawful manning provisions of the applicable Master Collective Bargaining Agreement shall be recognized.

12.1.3 Hire, promote and layoff employees as deemed appropriate to meet work requirements and/or skills required.

12.1.4 Require all employees to observe the County's Project Rules, the Contractor's Project Rules, Security and Safety Regulations, consistent with the provisions of this Agreement. The Contractor's and County's Project Rules and Regulations shall be reviewed and mutually agreed upon at the Pre-Job meeting and supplied to all employees and/or posted on the jobsite.

12.1.5 Discharge, suspend or discipline employees under the applicable MLA.

12.1.6 Assign and schedule work at its sole discretion and determine when overtime will be worked consistent with this Agreement and the applicable MLA.

12.1.7 Utilize any work methods, procedures or techniques and select and use any type or kind of materials, apparatus or equipment regardless of source, manufacturer or designator and in accordance with this Agreement, which covers the fabrication provisions and any other conflicts that are addressed in this Agreement.

12.2 The foregoing listing of management rights shall not be deemed to exclude other functions not specifically set forth herein. The Contractors, therefore, retain all legal rights not specifically enumerated in this Agreement.

ARTICLE 13

WORK RULES

13.1 Work Rules shall be governed by the applicable MLA for each craft.

ARTICLE 14

WAGE SCALES and FRINGE BENEFITS

14.1 All employees covered by this Agreement shall be classified and paid in accordance with the classification and wage scales contained in the appropriate MLAs which have been negotiated by the historically recognized bargaining parties and in compliance with the applicable general prevailing wage determination made by the Director of Industrial Relations pursuant to the California Labor Code.

14.2 For the duration of its work on this Project, the Contractors agree to recognize and put into effect such increases in wages and recognized fringe benefits as shall be negotiated between the various Union(s) and the historically recognized local bargaining parties on the effective date as set forth in the applicable MLA. The Union(s) shall notify the Contractors in writing of the specific increases in wages and recognized fringe benefits and the date on which they become effective.

14.3 The Contractors hereby adopt and agree to be bound by the written terms of the legally established Trust Agreements specifying the detailed basis on which payments are to be made into, and benefits paid out of, such appropriately qualified employee fringe benefit funds established by such appropriate Trust Agreements. The Contractors authorize the parties to such Trust Agreements to appoint Trustees and successor Trustees to administer the trust funds, and hereby ratify and accept the Trustees so appointed as if made by the Contractors.

14.4 If a Contractor fails to pay wages or benefits, the County agrees to honor a properly submitted, legally enforceable Stop Payment Notice.

ARTICLE 15

HOURS OF WORK, OVERTIME, SHIFTS and HOLIDAYS

15.1 The hours of work, establishment of overtime and the establishment of shifts and shift pay shall be governed by the applicable MLA for each craft and in accordance with the current General Prevailing Wage Determination made by the Director of Industrial Relations pursuant to the California Labor Code. It is understood that the County may, at its discretion, establish a uniform starting time and/or ending time.

15.2 Holidays and designated days off will be in compliance with the applicable General Prevailing Wage Determination made by the Director of Industrial Relations pursuant to the California Labor Code, unless otherwise set forth in the MLA.

ARTICLE 16

HEALTH AND SAFETY

16.1 The employees covered by the terms of this Agreement shall at all times, while in the employ of the Contractor, be bound by the safety rules and regulations as established by the County and Contractors and in accordance with OSHA/Cal-OSHA. These rules and regulations will be published and posted at conspicuous places throughout the Project site.

16.2 In accordance with the requirements of OSHA/Cal-OSHA, it shall be the exclusive responsibility of each Contractors working on the Project to assure safe working conditions for its employees and compliance by them with any safety rules contained herein or established by the Contractors or the County. Nothing in this Agreement shall in any way be construed to make the Union(s), the County, liable for safety violations on the Project.

16.3 The parties agree to abide by the substance abuse policies contained in the applicable MLA, subject to the Article 12. Should the County decide that there is a need for an OCIP on a Covered Project, the parties mutually agree to the side letter attached.

ARTICLE 17

LOCAL HIRING PROGRAM

17.1 The Parties agree to achieve the inclusion of Residents in the employment and apprenticeship opportunities created by the Covered Work, which will be known as the Local Hiring Program (LHP). With day-to-day support from the Coordinator, the Joint

Administrative Committee (JAC) formed pursuant to the provisions of Article 8 shall monitor the progress of the LHP and will serve as the central forum for representatives of all interested or affected parties to exchange information and ideas and to advise the County staff and the Coordinator concerning the operation and results of the LHP and the ongoing role of this Project Stabilization/Community Benefits Agreement as an integral component of LHP. As part of these responsibilities, the JAC will assess the obstacles to success of achieving inclusion of local Residents in the construction opportunities and shall make recommendations for a program to overcome some of those obstacles.

17.2 The parties agree to a goal that Residents of the County will perform up to 40 percent (40%) of all hours worked on all covered projects, on a craft-by-craft basis, if such workers are available, capable and willing to work on the projects, together with the apprentice goals established in Article 18, below.

17.3 The Contractors shall make good faith efforts to reach these goals, as described in Article 17.4 below and to reach these goals working through the normal hiring hall procedures listed in the MLA and the procedures identified in Article 18.4 and the County and Unions shall make good faith efforts to assist the Contractor in reaching this goal. In cases of alleged noncompliance, the issue may be referred to the Coordinator and then to the JAC for resolution. If the JAC can make no resolution, the issue may then be referred to Step 4 of Section 23.2.2 of the grievance procedure described in Article 14 for submission to an arbitrator for a final and binding determination. For purposes of resolution of any dispute arising under this Section or Article 18.4, the County shall be considered a party-in-interest with full right of participation in the arbitration proceeding.

17.4 The Contractors must take, and require their subcontractors to take, the following good faith steps to demonstrate that they have made every effort to reach the Local Hiring Goals:

17.4.1. The Contractors shall attend the scheduled pre-job meetings identified in Article 7. At this meeting, the Contractor must submit written workforce projections and projected man-hours on a craft-by-craft basis, consistent with the Contractor's bid proposal. In the event the pre-job meeting is waived, the Contractor must submit written workforce projections to the Coordinator within five (5) days.

17.4.2 Within one week of the issuance of the Notice to Proceed, the Contractors shall meet with the Coordinator to review and approve its compliance plan for reaching the Local Hiring Goals, using the required compliance plan form provided by the County.

17.4.3 The Contractors shall submit copies of hiring hall dispatch requests and responses to the Coordinator within ten (10) days of Coordinator's request at any point during the execution of the Project.

17.4.4 The Contractors shall immediately contact the Coordinator if a union hiring hall dispatcher will not or cannot, upon request of the Contractor, dispatch local

Residents.

17.4.5 The Contractors shall use the "Name Call," "Rehire" or other available hiring hall procedures to reach goals and shall provide documentation of such requests to the Coordinator upon request per subsection 17.4.3.

17.4.6 The Contractors shall use community based organizations as a resource for local labor resources, if a union will not or cannot provide local Residents as requested, and in conformity with the collectively bargained union hiring hall agreement.

17.4.7 The Contractors shall sponsor local Residents as defined herein for apprenticeship, when possible.

17.4.8 The Contractors shall maintain records for each Resident of Alameda County who was referred but not hired along with an explanation why the worker was not hired. Upon request, such records shall be made available for review by the County, Coordinator, and JAC for the duration of the Covered Projects.

17.4.9 The Contractors shall document participation in any local employment training programs and submit documentation of such to the Coordinator within ten (10) days if requested by Coordinator.

17.5 The Unions will exert their utmost efforts to recruit sufficient numbers of skilled craft persons who are Residents to fulfill the requirements of the Contractors. The parties to this Agreement support the development and placement of increased numbers of skilled construction workers from the Residents within the County to meet the needs of the covered project and the requirements of the industry generally.

17.6 To the extent possible, the parties agree to implement the Local Hiring Program while complying with the County's Local Vendor Preference and Enhanced Construction Outreach (ECOP) programs for the covered project. To the extent that the County determines, in its sole discretion, that there is a conflict between the Local Hiring Program established in this Agreement and the County's SLEB, ECOP, and/or Local Vendor Preference Programs, the conflict shall be resolved in favor of the Local Hiring Program on the construction work covered by this Agreement.

17.7 For the purposes of reaching the goal established in Article 17.2, a Contractor may qualify for full credit toward the goal by employing Alameda County Residents for other work the Contractor is performing in any of the nine Bay Area counties of: Alameda, Contra Costa, San Francisco, San Mateo, Santa Clara, Marin, Solano, Napa and Sonoma. Credit will only be given for work performed during the life of the Covered Project. In order to receive such credit, the Contractor must submit certified payrolls as documentation to the Coordinator. No credit for off-site work will be allowed until the Contractor has demonstrated a good faith effort to reach the goal on the Covered Projects and has received approval from the JAC.

ARTICLE 18

APPRENTICES

18.1 Recognizing the need to maintain continuing support of programs designed to develop adequate numbers of competent apprentice workers in the construction industry, the Contractors will make a good faith effort to employ apprentices in the respective crafts to perform such work as is within their capabilities and which is customarily performed by the craft in which they are indentured.

18.2 For the purpose of meeting the goals of this Article 18, the parties recognize State-approved apprenticeship training programs administered by Joint Labor/Management Apprenticeship Training Committees (JATC) as the sole source for an eighteen month trial period. If after the eighteen month trial period, it has been demonstrated that the JATCs are unable to provide sufficient Residents to meet the established goals, the parties to this agreement will meet to negotiate implementation strategies to meet the established goals. If resolution is not reached within six months, then the parties may refer the item to the grievance procedure as outlined in Article 23.

18.3 The Signatory parties agree that the County shall make available to the Unions a database of apprentices qualifying under the local hiring provisions of this Agreement. The Signatory Unions agree to report in accordance within any limits set by applicable labor law, the availability and dispatch/placement of qualifying apprentices. The reports will be submitted to the Coordinator on at least a quarterly basis and more often, if requested and possible.

18.4 For each Covered Project, the Contractors will be responsible to ensure that it and/or its subcontractors hire at least one (1) new apprentice for the first $1 million of construction value and for each succeeding $5 million of construction contract value, the Contractors and/or their subcontractors will be required to hire at least one (1) additional new apprentice. All such apprentices may be graduates of pre apprenticeship programs with a known and successful track record of apprentice placement into jobs. All the pre apprenticeship program graduates must be Residents of Alameda County and members of a Disadvantaged Population, as described in Article 1.

18.4.1. Contractors will make a good faith effort to maximize the project work hours for the new hire apprentices, and shall report those hours to the JAC, which will evaluate those good faith efforts.

18.4.2 Each Signatory Union will be responsible for dispatching/referring such County Residents to the contractor if they are available, capable and willing to work on the Covered Projects. No one trade can be used to satisfy the goal by the provision of more than two (2) such first stage apprentices, unless required by the nature of the work and or agreed upon by the JAC.

18.4.3 The Signatory Unions and Contractors shall exercise, to the extent of their authority, their best efforts to recruit apprenticeship program applicants from Residents and who are members of a Disadvantaged Population, as defined in Article 1. Further, for apprentices hired to comply with Article 18.4, there will be no limitation on where such apprentices will work subsequent to being hired for the Covered Projects. Contractors will be allowed to receive credit for Article 18.4 when utilizing apprentices for non-Project work during the life of the Covered projects, regardless of the location of the work as long as it is in the nine (9) Bay Area counties described in Article 18.4.5.

18.4.4 The Contractor shall request dispatch of apprentices in writing from the local Unions and/or Joint Apprenticeship Training Committee in which the Contractor participates. Copies of the written requests shall be provided to the Coordinator within ten (10) days of request by the Coordinator. The Unions shall honor all Contractor dispatch requests for such Apprentices.

18.4.5 For the purposes of meeting the goal established in Section 18.4, a Contractor may qualify for full credit toward the goal by employing Alameda County Residents as apprentices for other work the Contractor is performing in any of the nine Bay Area counties of: Alameda, Contra Costa, San Francisco, San Mateo, Santa Clara, Marin, Solano, Napa and Sonoma. Credit will only be given for work performed during the life of the Covered projects. In order to receive such credit, the Contractor must submit certified payrolls as documentation to the Coordinator. No credit for non-Covered Projects work will be allowed until the Contractor has demonstrated a good faith effort to reach the goal on the Covered projects and has received approval from the JAC.

18.5 The Unions will cooperate with the County, the Contractors, and the Coordinator in conducting outreach activities to recruit and refer qualified Alameda County Resident applicants to apprenticeship programs. In addition, the Unions will work with designated pre-apprenticeship programs to promote graduates and enhance their entry into the Apprenticeship programs.

18.6 To the extent permitted by law and the JATC requirements, the Unions will give credit to bona fide, provable past experience to applicants, including work for non-union Contractors who become signatory to the PS/CBA. The experience and practical knowledge of applicants will be reviewed and tested by the applicable Joint Apprenticeship Training Committee. Applicants will be placed at the appropriate stage of apprenticeship or journey level as the case may be. Final decisions will be the responsibility of the applicable Joint Apprenticeship Training Committee.

ARTICLE 19

REFERRAL PROCESS

19.1 The Union(s) shall be the primary source of all craft labor employed on the Project. However, in the event that a Contractor has its own core workforce, the Contractors may request by name, and the Union(s) shall honor, referral of persons who have applied to the local union for Project work and who demonstrate the following qualifications ("Core Employees"):

19.1.1 possess any license and/or certifications required by state or federal law for the Project work to be performed;

19.1.2 have worked a total of at least one thousand (1,000) hours in the construction craft during the prior three (3) years;

19.1.3 were on the Contractors' active payroll for at least sixty (60) out of the one hundred forty (140) calendar days prior to the contract award; and

19.1.4 have the ability to perform safely the basic functions of the applicable trade.

19.1.5 be a resident of Alameda County at least six months prior to the hire date.

19.2 In the case of a Sole Proprietor/Owner Operator that is self-performing work, this Sole Proprietor/Owner Operator is not required to request a dispatch from the union hall. Sole Proprietors/Operators must be certified as such by some public agency acceptable to the County and the affected signatory unions. If the Sole Proprietor/Owner Operator hires employees subsequent to starting work on Covered Projects, all such employees would need to be requested from the union hall as described in subsection 19.3 below

19.3 The Union(s) will first refer to such Contractors one journeyman employee from the hiring hall out-of-work list for the affected trade or craft, and will thereafter refer one of such Contractors' "core" employees as a journeyman and shall repeat the process, one and one, until such Contractors' crew requirements are met or until such Contractors have hired no more than five (5) Core Employees, whichever occurs first. Thereafter, all additional employees shall be hired exclusively from the Union(s)' hiring hall out-of-work list(s). For the duration of the Contractors' work the ratio shall be maintained and when the Contractors' workforce is reduced, Employees shall be laid off in the same ratio of core employees to hiring hall referrals as was applied in the initial hiring. Contractors signatory to a Local, Regional, and/or National collective bargaining agreement(s) with Signatory Union(s) hereto shall be bound to use the hiring hall provisions contained in the relevant MLA of the affected Union(s), and nothing in the referral provisions of this Agreement shall be construed to supersede the local hiring hall provisions of the MLAs as they relate to such Contractors.

19.4 For purposes relating to "Owner/Operators" used for the hauling of workers and materials, including water or oil. It is agreed that the Owner/Operator doing such hauling work may be dispatched to the job first (as a core employee) provided that such Owner/Operator has complied with and completed all registration requirements with the Union prior to dispatch.

19.5 All Contractors shall be bound by and utilize the registration facilities and referral systems established or authorized by the Signatory Union(s) so long as such procedures are in compliance with applicable federal, state or local law. The Contractor shall have the right to determine the competency of all employees and may reject any referral for any reason, provided that the Contractor complies with Article 22, Non-Discrimination, and in accordance with the applicable MLA.

19.6 In accordance with the Master Labor Agreement and in the event that referral facilities maintained by the Union(s) are unable, despite good faith efforts, to fill the request of a Contractor for employees within a forty-eight (48) hour period after such request is made by the Contractor, Saturdays, Sundays and Holidays excluded, the Contractor shall be free to obtain work persons from any source ("Alternative Employees"). Upon hiring Alternative Employees, the Contractor shall immediately notify the appropriate Union(s) of the name and address of the Alternative Employees hired, which Alternative Employees shall be bound by the provisions of this Article and the Union(s)' hiring hall rules.

19.7 The Union(s) will exert their utmost efforts to recruit sufficient numbers of skilled craft persons to fulfill the requirements of the Contractors. The parties to this Agreement support the development of increased numbers of skilled construction workers from the Residents of Alameda County to meet the needs of the Project and the requirements of the industry generally. Accordingly, contingent upon request by the Contractor, the Unions agree to encourage the referral and utilization of Residents as journeyman and apprentices on the Project and the entrance of Residents into apprenticeships and training programs, as long such Residents possess the requisite skills and qualifications.

ARTICLE 20

DATA COLLECTION AND REPORTING

20.1 This article describes data collection, reporting guidelines and responsibilities for parties signatory to the PSCBA.

20.2 The County shall be responsible for collecting and maintaining accurate data on the availability of the Disadvantaged Population Residents available, capable and willing to work on Projects. This data will be made available and accessible to the Union.

20.3 On a monthly basis, Contractors must submit reports on the status and progress of local hiring on a craft by craft basis, including utilization of apprentices.

20.4 The signatory Unions agree to report in accordance with any limits set by applicable labor law, the availability and dispatch/placement of apprentices. These reports will be submitted to the Coordinator on at least a quarterly basis and more often, if requested and possible.

20.4.1 In advance of pre-job meetings, the Union shall assist the Coordinator with developing a current list of Disadvantaged Population first stage apprentices available to work on the project.

20.4.2 At pre-job meetings, the Coordinator shall supply contractors with a current list of Disadvantaged Population apprentices and their status of completion of their apprenticeship.

20.4.3 On a quarterly basis, the Union shall provide the County and Coordinator a report on the status of Disadvantaged Population apprentices, including but not limited to their placement and advancement

20.5 On an annual basis, the Union, County and Coordinator shall provide a report for the Board of Supervisor's review as described and required in Article 27.1. This report shall include but not be limited to the local hiring and apprentice goal performance, as well as challenges and benefits of the PSCBA.

ARTICLE 21

HELMETS TO HARDHATS: VETERAN EMPLOYMENT

21.1 The Contractors and the Unions recognize a desire to facilitate the entry into the building and construction trades of veterans who are interested in careers in the building and construction industry. The Contractors and Unions agree to utilize the services of the Center for Military Recruitment, Assessment and Veterans Employment (hereinafter "Center) and Center's "Helmets to Hardhats" program to serve as a resource for preliminary orientation, assessment of construction aptitude, referral to apprenticeship programs or hiring halls, counseling and mentoring, support network, employment opportunities and other needs as identified by the Contractors and the Unions.

21.2 The Unions and Contractors agree to coordinate with the Center to create and maintain an integrated database of veterans interested in working on the Project and of apprenticeship and employment opportunities for this Project. To the extent permitted by law, the Unions will give credit to such veterans for bona fide, provable past experience.

21.3 The Contractors may also utilize the services of the "Swords to Ploughshares" program.

ARTICLE 22

NON-DISCRIMINATION

22.1 The Unions and Contractors shall not discriminate against any employee or applicant for employment because of race, creed, color, sex, actual or perceived sexual orientation, national origin, age, religion, political affiliation, or membership or non-membership in labor organization union activity, military veteran status, and disability as identified in the Americans With Disabilities Act, or any other basis recognized by law.

ARTICLE 23

GRIEVANCE PROCEDURE

23.1 All disputes concerning the interpretation and/or application of this Agreement that do not fall within the Article 11 No-Strike/No-Lockout procedure, Article 6 Work Assignments and Jurisdictional Disputes, Article 17 Local Hiring Program, or Article 18 Apprentices, shall be governed by the following grievance and arbitration procedure.

23.2 Grievances between one or more Union(s) and one or more Contractor regarding interpretation and/or application of this Agreement shall be pursued according to the following provisions:

23.2.1 A grievance shall be considered null and void if not brought to the attention of the Contractors or the Union(s) within ten (10) working days after the grievance is alleged to have occurred but in no event more than thirty (30) days after the charging party became aware of the event giving rise to the dispute.

23.2.2 Grievances between one or more Union(s) and one or more Contractors regarding provisions of this Agreement shall be settled or otherwise resolved according to the following Steps and provisions:

Step 1: The Contractors or the Union(s)' representative and the grievant shall attempt to resolve the grievance with the craft supervisor or Steward.

Step 2: In the event the matter remains unresolved in Step 1 above, within five (5) working days, the grievance shall be reduced to writing and may then be referred by the Contractors or Union(s) to the grievant for discussion and resolution.

Step 3: In the event that the representatives are unable to resolve the dispute within the five (5) working days after its referral to Step 2, either involved party may submit it within five (5) working days to the Joint Administrative Subcommittee, established in Section 10.2, which shall meet within five (5)

working days after such referral (or such longer time as is mutually agreed upon by the representatives on the Joint Administrative Subcommittee) to confer in an attempt to resolve the grievance. Regardless of which party has initiated the grievance proceeding, prior to the meeting of the Joint Administrative Subcommittee, the Union shall notify its international union representative(s), which shall advise both parties if it intends on participating in the meeting. The participation by the International Union Representative in this Step 3 meeting shall not delay the time set herein for the meeting, unless otherwise mutually agreed by the parties. Decisions by the Joint Administrative Subcommittee shall be by majority vote with such resolutions to be final and binding on all signatories of the Agreement. If the dispute is not resolved by the Joint Administrative Subcommittee, it may be referred within five (5) working days by either party to Step 4.

Step 4: In the event the matter remains unresolved in Step 3, either Party may request, within five (5) working days, that the dispute be submitted to arbitration. The time limits set out in this procedure may, upon mutual agreement, be extended. Any request for arbitration, request for extension of time limits, and agreement to extend such time limits shall be in writing.

Step 5: Within seven (7) calendar days after referral of dispute in Step 4, the parties shall choose an arbitrator for final and binding arbitration. The parties agree that an arbitrator shall be selected by the alternate striking method from the following list. The party who shall strike the first name shall be selected by the toss of a coin (1) Carol Isen (2) Barbara Kong-Brown (3) Thomas Angelo (4) Robert Hirsch (5) William Ricker. Should a Party to the procedure fail or refuse to participate in the hearing, if the Arbitrator determines that proper notice of the hearing has been given, said hearing shall proceed to a default award. The Arbitrator's award shall be final and binding on all Parties to the arbitration. The costs of the arbitration, including the arbitrator's fee and expenses, shall be borne equally by the Parties. The Arbitrator's decision shall be confined to the question(s) posed by the grievance and the Arbitrator shall not have authority to modify amend, alter, add to, or subtract from, any provisions of this Agreement.

23.3 Grievances raised by County against one or more Union(s) and/or the Building Trades Council, or against the County by one or more Union(s) and/or the Building Trades Council, regarding provisions of this Agreement, shall be settled or otherwise resolved according to the following Steps and provisions:

23.3.1. A grievance shall be considered null and void if not brought to the attention of the County or the Union(s) within ten (10) working days after the grievance is alleged to have occurred but in no event more than ten (10) days after the charging party became aware of the event giving rise to the dispute.

Step 1: The County/Union(s) Joint Administrative Subcommittee shall attempt to resolve the grievance. The County/Union(s) Joint Administrative Subcommittee shall meet within five (5) working days after receipt of the grievance (or such longer time as is mutually agreed upon by the representatives on this Joint Administrative Subcommittee) to confer with regard to the grievance. Decisions by the Joint Administrative Subcommittee shall be by majority vote with such resolutions to be final and binding on all signatories of the Agreement. If the dispute is not resolved by the Joint Administrative Subcommittee, within the five (5) working days after meeting on the grievance, either involved party may proceed to Step 2.

Step 2: In the event the matter remains unresolved pursuant to Step 2, either Party may request that the dispute be submitted to arbitration. The time limits set out in this procedure may, upon mutual agreement, be extended. Any request for arbitration, request for extension of time limits, and agreement to extend such time limits shall be in writing.

Step 3: Within seven (7) calendar days after referral of dispute in Step 2, the parties shall choose an arbitrator for final and binding arbitration. The parties agree that an arbitrator shall be selected by the alternate striking method from the following list. The party who shall strike the first name shall be selected by the toss of a coin (1) Carol Isen (2) Barbara Kong-Brown (3) Thomas Angelo (4) Robert Hirsch (5) William Ricker. Should a Party to the procedure fail or refuse to participate in the hearing, if the Arbitrator determines that proper notice of the hearing has been given, said hearing shall proceed to a default award. The Arbitrator's award shall be final and binding on all Parties to the arbitration. The costs of the arbitration, including the arbitrator's fee and expenses, shall be borne equally by the Parties. The Arbitrator's decision shall be confined to the question(s) posed by the grievance and the Arbitrator shall not have authority to modify amend, alter, add to, or subtract from, any provisions of this Agreement.

23.4 Where an issue is addressed in this Agreement and an MLA, this Agreement shall prevail. Where an issue is addressed in an MLA and not in this Agreement, the MLA shall control.

23.5 Grievances between a Union(s) and a Union(s)' signatory contractor involving interpretation or application of the Master Agreement shall be governed by the grievance procedures contained in the Master Agreement.

ARTICLE 24

MISCELLANEOUS PROVISIONS

24.1 Counterparts. This Agreement may be executed in counterparts, such that original signatures may appear on separate pages, and when bound together all necessary signatures shall constitute an original. Facsimile signature pages transmitted to other parties to this Agreement shall be deemed equivalent to original signatures.

24.2 Warranty of Authority. Each of the persons signing this Agreement represents and warrants that such person has been duly authorized to sign this Agreement on behalf of the party indicated, and each of the parties by signing this Agreement warrants and represents that such party is legally authorized and entitled to enter into this Agreement.

24.3 Ratification by Governing Board. This Agreement shall not be binding on the County until it is ratified by the Board of Supervisors.

ARTICLE 25

ENTIRE AGREEMENT

25.1 This Agreement represents the complete understanding of the parties. The provisions of this Agreement, including the MLAs, shall in every instance exclusively apply to and control work performed on the Project. The provisions of this Agreement shall take precedence over provisions of local, area, regional or national labor agreements. Nothing contained in the MLAs, working rules, by-laws, constitution and other similar documents of the Unions, shall in any way affect, modify or add to this Agreement unless otherwise specifically indicated in this Agreement or mutually agreed to in writing and executed by the parties. Practices not part of the terms and conditions of this Agreement shall not be recognized.

25.2 The Unions agree that this Agreement covers all matters affecting wages, hours and other terms and conditions of employment, and that during the terms of this Agreement, neither the Contractors, nor the Unions will be required to negotiate on any further matters affecting these or any other subject not specifically set forth in this Agreement except by mutual agreement of the Unions involved and the County.

25.3 The parties to this Agreement understand and agree that nothing in this Agreement shall supersede or take precedence over any Board policy or requirement including, but not limited to, the construction contract, contract documents, project manual, and general conditions for the Project.

25.4 Provisions negotiated into any new or modified MLA which are less favorable to the Contractor shall not apply to work covered by this Agreement. Any disagreement between the parties regarding the application of the provisions of any new or modified

MLA shall be resolved under the dispute and grievance arbitration procedures set forth in Article 23.

25.5 This Agreement may be executed in counterparts, such that the original signatures may appear on separate pages and when bound together all necessary signatures shall constitute an original. Facsimile signature pages transmitted to other parties to this Agreement shall be deemed the equivalent to original signatures.

ARTICLE 26

GENERAL SAVINGS CLAUSE

26.1 It is not the intention of the parties to violate any laws governing the subject matter of this Agreement. If any Article or provision of this Agreement shall be declared invalid, inoperative, or unenforceable by any competent authority of the executive, legislative, judicial or administrative branch of the federal, state or local government, the parties shall suspend the operation of each such article or provision during the period of invalidity. Such suspension shall not affect the operation of any provision covered in this Agreement to which the law or regulation is not applicable. Further, parties agree that if and when any or all provisions of this Agreement are finally held or determined to be illegal or void by a Court of competent jurisdiction, the parties will promptly enter into negotiations concerning the substance affected by such decision for the purpose of achieving conformity with the requirements of an applicable law and the intent of the parties hereto.

ARTICLE 27

DURATION OF AGREEMENT

27.1 This Agreement shall become effective on the day the County Board of Supervisors ratifies this Agreement and shall continue in full force and effect for 3 years. In the event that either party wishes to amend, modify or otherwise alter this Agreement at the end of three (3) years, written notice shall be delivered between sixty (60) and thirty (30) days prior to expiration. If neither party provides said written notice, this Agreement shall remain in effect for an additional two (2) years. At the end of a total of five (5) years, if parties so desire they may enter negotiations for a new Agreement or an extension to be determined. There shall be an annual report with a presentation to the County Board of Supervisors prepared by the General Services Agency in collaboration with other applicable County Departments.

SIGNATURES

County of Alameda

By: _____
President, Board of Supervisors

Approved as to Form:
Donna R. Ziegler, County Counsel

By: _____
Deputy County Counsel

Building & Construction Trades Council of Alameda County:

By: _____
Andreas Cluver, Secretary-Treasurer

Signatory Unions:

Asbestos Workers, Local 16 By: _____

Boilermakers, Local 549 By: _____

Bricklayers & Allied Craftsmen, Local 3 By: _____

Northern California Carpenters Regional Council (on behalf of Carpenters, Local 713, Carpenters, Local 2236, Lathers, Local 68L, Millwrights, Local 102, Pile Drivers, Local 34) By: _____

Cement Masons, Local 300 By: _____

Electrical Workers, Local 595 By: _____

Elevator Constructors, Local 8 By: _____

Hod Carriers, Local 166 By: _____

Iron Workers, Local 378 By: _____

Laborers, Local 67 By: _____

Laborers, Local 304 By: _____

Operating Engineers, Local 3 By: _____

Plasterers, Local 66 By: _____

Roofers, Local 81 By: _____

Sheet Metal Workers, Local 104 By: _____

Sign Display, Local 510 By: _____

Sprinkler Fitters, Local 483 By: _____

Teamsters, Local 853 By: _____

United Association of Journeymen and Apprentices Fitting Industry, Underground Utility & Landscape, Local 355 By: _____

Cement Masons, Local 300	By: _____
Electrical Workers, Local 595	By: _____
Elevator Constructors, Local 8	By: _____
Hod Carriers, Local 166	By: _____
Iron Workers, Local 378	By: _____
Laborers, Local 67	By: _____
Laborers, Local 304	By: _____
Operating Engineers, Local 3	By: _____
Plasterers, Local 66	By: _____
Roofers, Local 81	By: _____
Sheet Metal Workers, Local 104	By: _____
Sign Display, Local 510	By: _____
Sprinkler Fitters, Local 483	By: _____
Teamsters, Local 853	By: _____
United Association of Journeymen and Apprentices Fitting Industry, Underground Utility & Landscape, Local 355	By: _____

United Association of Steamfitters, Pipefitters, Plumbers, & Gas Fitters, Local 342

By: Manuel Hernandez

District Council No. 16 Northern California International Union of Painters & Allied Trades (on behalf of Auto & Marine Painters, Local 1176, Carpet & Linoleum Layers, Local 12, Glaziers, Architectural Metal & Glassworkers, Local 169, Painters & Tapers, Local 3

By: _____

EXHIBIT A (Letter of Asqent)

PROJECT STABILIZATION/COMMUNITY BENEFITS AGREEMENT

for the

COUNTY OF ALAMEDA
CONTRACTOR AGREEMENT TO BE BOUND

The undersigned, as a Contractor or Subcontractor (CONTRACTOR) on the County of Alameda, (hereinafter PROJECTS), for and in consideration of the award to it of a contract to perform work on said PROJECTS, and in further consideration of the mutual promises made in the "Project Stabilization/Community Benefits Agreement for the County of Alameda Project" (hereinafter AGREEMENT), a copy of which was received and is acknowledged, hereby:

(1) Accepts and agrees to be bound by the terms and conditions of the AGREEMENT, together with any and all amendments and supplements now existing or which are later made thereto:

(2) The CONTRACTOR agrees to be bound by the legally established local trust agreements as set forth in Article 14 of this AGREEMENT.

(3) The CONTRACTOR authorizes the parties to such local trust agreements to appoint trustees and successor trustees to administer the trust funds and hereby ratifies and accepts the trustees so appointed as if made by the CONTRACTOR;

(4) Certifies that it has no commitments or agreements which would preclude its full and complete compliance with the terms and conditions of said AGREEMENT.

(5) Agrees to secure from any CONTRACTORS (as defined in said AGREEMENT) which is or becomes a Subcontractor (of any tier) to it, a duly executed Agreement to be Bound in form identical to this document.

Dated: _____

_____
(Name of Contractor)

_____
(Name of Prime Contractor or Higher Level Subcontractor)

_____
(Authorized Officer & Title)

CA Number _____

_____
(Address)

Contract Or Project #_____

_____
(Phone) (Fax)

MEMORANDUM OF UNDERSTANDING

COUNTY OF ALAMEDA
PROJECT STABILIZATION/COMMUNITY BENEFIT AGREEMENT

Notwithstanding any provision to the contrary in the County of Alameda Project Stabilization/Community Benefit Agreement ("Project Stabilization Agreement"), this memorandum will confirm that work covered by the Project Stabilization/Community Benefits Agreement within the craft jurisdiction of the Elevator Constructors will be performed under the terms of the National Agreement of the International Union of Elevator Constructors, except that Articles 6,11 and 23 of the Project Stabilization Agreement will apply to such work.

County of Alameda

_____
President, Board of Supervisor

Date _____

INTERNATIONAL UNION OF
ELEVATOR CONSTRUCTORS
LOCAL UNION NO. 8

Eric W. McClay

Date 5-20-2013

Approved as to Form:
Donna R. Ziegler, County Counsel

By: Chaney Beaman
Deputy County Counsel

MEMORANDUM OF UNDERSTANDING

COUNTY OF ALAMEDA
PROJECT STABILIZATION/COMMUNITY BENEFIT AGREEMENT

In the event the County decides to cover any given Project with an Owner Controlled Insurance Program (OCIP) during the life of the PS/CBA, the following language will apply:

The County intends to implement an OCIP, or wrap up insurance, on the Project. All Contractors and employees performing work on the Project, and not otherwise excluded from the OCIP; will be bound by the requirement of the OCIP Safety Manual; provided however, discipline imposed for alleged violations of the OCIP Safety Manual is subject to the Grievance procedures in Article 23. Any drug testing protocol established by the Contractor for the Project shall satisfy the requirements of the OCIP Safety Manual and be consistent with the MLAs. In the event that there is a conflict between the MLAs and the OCIP requirements, the OCIP requirements shall prevail.

County of Alameda

By:_____
President, Board of Supervisor

Date _____

Building & Construction Trades Council of Alameda County:

By: _____
Andreas Cluver, Secretary-Treasurer

Date 5/21/13

Approved as to Form:
Donna R. Ziegler, County Counsel

By: _____
Deputy County Counsel

MEMORANDUM OF UNDERSTANDING

COUNTY OF ALAMEDA
PROJECT STABILIZATION/COMMUNITY BENEFIT AGREEMENT

The parties agree that the PLA to which this letter is addended shall not apply to any contracts entered into by the Alameda County Public Works Agency for a period of three years from the effective date of the PLA, except that any and all trucking, as described in Article 5.4 of said PLA, shall be covered by the PLA.

Any disputes concerning the interpretation and or application of this side letter shall be subject to the dispute resolution process set forth in Article 23 of the PLA.

County of Alameda

By:_____
President, Board of Supervisor

Date_____

Building & Construction Trades Council of Alameda County:

By: _____
Andreas Cluver, Secretary-Treasurer

Date 5/21/13

Approved as to Form:
Donna R. Ziegler, County Counsel

By: _____
Deputy County Counsel

MEMORANDUM OF UNDERSTANDING

COUNTY OF ALAMEDA
PROJECT STABILIZATION/COMMUNITY BENEFIT AGREEMENT

Notwithstanding any provision to the contrary in the County of Alameda Project Stabilization/Community Benefit Agreement ("Project Stabilization Agreement"), this memorandum will confirm that work covered by the Project Stabilization/Community Benefits Agreement within the craft jurisdiction of the Elevator Constructors will be performed under the terms of the National Agreement of the International Union of Elevator Constructors, except that Articles 6,11 and 23 of the Project Stabilization Agreement will apply to such work.

County of Alameda

President, Board of Supervisor

Date JUN 11 2013

INTERNATIONAL UNION OF
ELEVATOR CONSTRUCTORS
LOCAL UNION NO. 8

Eric W. McCloud

Date 5-20-2013

Approved as to Form:
Donna R. Ziegler, County Counsel

By: Chaney Braman
Deputy County Counsel

DOCUMENT 00 73 56

HAZARDOUS MATERIALS PROCEDURES & REQUIREMENTS

1. Summary

This document includes information applicable to hazardous materials and hazard waste abatement.

2. Notice of Hazardous Waste or Materials Conditions

2.1. Contractor shall give notice in writing, including by e-mail, to the County, the Construction Manager, and the Architect promptly, before any of the following conditions are disturbed, and **in no event later than twenty-four (24) hours after first observance**, of any:

2.1.1. Material that Contractor believes may be material that is hazardous waste or hazardous material, as defined in section 25117 or 25260 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law;

2.1.2. Other material that may present a substantial danger to persons or property exposed thereto in connection with Work at the site.

2.2. Contractor's written notice shall indicate whether the hazardous waste or material was shown or indicated in the Contract Documents to be within the scope of Work, and whether the materials were brought to the site by Contractor, its Subcontractors, suppliers, or anyone else for whom Contractor is responsible. As used in this section the term "hazardous materials" shall include, without limitation, asbestos, lead, mercury, Polychlorinated biphenyl (PCB), petroleum and related hydrocarbons, and radioactive material.

2.3. In response to Contractor's written notice, the County shall investigate the identified conditions.

2.4. If the County determines that conditions do not involve hazardous materials or that no change in terms of Contract is justified, the County shall so notify Contractor in writing, stating reasons. If the County and Contractor cannot agree on whether conditions justify an adjustment in Contract Price or Contract Times, or on the extent of any adjustment, Contractor shall proceed with the Work as directed by the County.

2.5. If after receipt of notice from the County, Contractor does not agree to resume Work based on a reasonable belief it is unsafe, or does not agree to resume Work under special conditions, then County may order such portion of Work that is in connection with such

hazardous condition or such affected area to be deleted from the Work, or performed by others, or County may invoke its rights to terminate the Contract in whole or in part. County will determine entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Times as a result of deleting such portion of Work, or performing the Work by others.

2.6. If Contractor stops Work in connection with any hazardous condition and in any area affected thereby, Contractor shall immediately redeploy its workers, equipment, and materials, as necessary, to other portions of the Work to minimize delay and disruption.

3. **Additional Warranties and Representations**

3.1. Contractor represents and warrants that it, its employees, and its subcontractors and their employees, shall at all times have the required levels of familiarity with the Site and the Work, training, and ability to comply fully with all applicable law and contract requirements for safe and expeditious performance of the Work, including whatever training is or may be required regarding the activities to be performed (including, but not limited to, all training required to address adequately the actual or potential dangers of Contract performance).

3.2. Contractor represents and warrants that it, its employees, and its subcontractors and their employees, shall at all times have and maintain in good standing any and all certifications and licenses required by applicable federal, state, and other governmental and quasi-governmental requirements applicable to the Work.

3.3. Contractor represents and warrants that it has studied carefully all requirements of the Specifications regarding procedures for demolition, hazardous waste abatement, or safety practices, specified in the Contract, and prior to submitting its bid, has either (a) verified to its satisfaction that the specified procedures are adequate and sufficient to achieve the results intended by the Contract Documents, or (b) by way of approved "or equal" request or request for clarification and written Addenda, secured changes to the specified procedures sufficient to achieve the results intended by the Contract Documents. Contractor accepts the risk that any specified procedure will result in a completed Project in full compliance with the Contract Documents.

4. Monitoring and Testing

4.1. County reserves the right, in its sole discretion, to conduct air monitoring, earth monitoring, Work monitoring, and any other tests (in addition to testing required under the agreement or applicable law), to monitor Contract requirements of safe and statutorily compliant work methods and (where applicable) safe re-entry level air standards under state and federal law upon completion of the job, and compliance of the work with periodic and final inspection by public and quasi-public entities having jurisdiction.

4.2. Contractor acknowledges that County has the right to perform, or cause to be performed, various activities and tests including, but not limited to, pre-abatement, during abatement, and post-abatement air monitoring, that County shall have no obligation to perform said activities and tests, and that a portion of said activities and tests may take place prior to the completion of the Work by Contractor. In the event County elects to perform these activities and tests, Contractor shall afford County ample access to the Site and all areas of the Work as may be necessary for the performance of these activities and tests. Contractor will include the potential impact of these activities or tests by County in the Contract Price and the Scheduled Completion Date.

4.3. Notwithstanding County's rights granted by this paragraph, Contractor may retain its own industrial hygiene consultant at Contractor's own expense and may collect samples and may perform tests including, but not limited to, pre-abatement, during abatement, and post-abatement personal air monitoring, and County reserves the right to request documentation of all such activities and tests performed by Contractor relating to the Work and Contractor shall immediately provide that documentation upon request.

5. Compliance with Laws

5.1. Contractor shall perform safe, expeditious, and orderly work in accordance with the best practices and the highest standards in the hazardous waste abatement, removal, and disposal industry, the applicable law, and the Contract Documents, including, but not limited to, all responsibilities relating to the preparation and return of waste shipment records, all requirements of the law, delivering of all requisite notices, and obtaining all necessary governmental and quasi-governmental approvals.

5.2. Contractor represents that it is familiar with and shall comply with all laws applicable to the Work or completed Work including, but not limited to, all federal, state, and local laws, statutes, standards, rules, regulations, and ordinances applicable to the Work relating to:

5.2.1. The protection of the public health, welfare and environment;

5.2.2. Storage, handling, or use of asbestos, PCB, lead, petroleum based products or other hazardous materials;

5.2.3. The generation, processing, treatment, storage, transport, disposal, destruction, or other management of asbestos, PCB, lead, petroleum, or hazardous waste materials or other waste materials of any kind; and

5.2.4. The protection of environmentally sensitive areas such as wetlands and coastal areas.

6. Disposal

6.1. Contractor has the sole responsibility for determining current waste storage, handling, transportation, and disposal regulations for the job Site and for each waste disposal facility. Contractor must comply fully at its sole cost and expense with these regulations and any applicable law. County may, but is not obligated to, require submittals with this information for it to review consistent with the Contract Documents.

6.2. Contractor shall develop and implement a system acceptable to County to track hazardous waste from the Site to disposal, including appropriate "Hazardous Waste Manifests" on the EPA form, so that County may track the volume of waste it put in each landfill and receive from each landfill a certificate of receipt.

6.3. Contractor shall provide County with the name and address of each waste disposal facility prior to any disposal, and County shall have the express right to reject any proposed disposal facility. Contractor shall not use any disposal facility to which County has objected. Contractor shall document actual disposal or destruction of waste at a designated facility by completing a disposal certificate or certificate of destruction forwarding the original to the County.

7. Permits

7.1. Before performing any of the Work, and at such other times as may be required by applicable law, Contractor shall deliver all requisite notices and obtain the approval of all governmental and quasi-governmental authorities having jurisdiction over the Work. Contractor shall submit evidence satisfactory to County that it and any disposal facility

7.1.1. have obtained all required permits, approvals, and the like in a timely manner both prior to commencement of the Work and thereafter as and when required by applicable law, and

7.1.2. are in compliance with all such permits, approvals and the regulations.

For example, before commencing any work in connection with the Work involving asbestos-containing materials, or PCBs, or other hazardous materials subject to regulation, Contractor agrees to provide the required notice of intent to renovate or demolish to the appropriate state or federal agency having jurisdiction, by certified mail, return receipt requested, or by some other method of transmittal for which a return receipt is obtained, and to send a copy of that notice to County. Contractor shall not conduct any Work involving asbestos-containing materials or PCBs unless Contractor has first confirmed that the appropriate agency having jurisdiction is in receipt of the required notification. All permits, licenses, and bonds that are required by governmental or quasi-governmental authorities, and all fees, deposits, tap fees, offsite easements, and asbestos and PCB disposal facilities expenses necessary for the prosecution of the Work, shall be procured and paid for by Contractor. Contractor shall give all notices and comply with the all applicable laws bearing on the conduct of the

Work as drawn and specified. If Contractor observes or reasonably should have observed that Plans and Specifications and other Contract Documents are at variance therewith, it shall be responsible for promptly notifying County in writing, including by e-mail, of such fact. If Contractor performs any Work contrary to applicable laws, it shall bear all costs arising therefrom.

7.2. In the case of any permits or notices held in County's name or of necessity to be made in County's name, County shall cooperate with Contractor in securing the permit or giving the notice, but the Contractor shall prepare for County review and execution upon approval, all necessary applications, notices, and other materials.

8. Indemnification

8.1. To the extent permitted by law, the indemnities and limitations of liability expressed throughout the Contract Documents apply with equal force and effect to any claims or liabilities imposed or existing by virtue of the removal, abatement, and disposal of hazardous waste. This includes, but is not limited to, liabilities connected to the selection and use of a waste disposal facility, personal injury, property damage, loss of use of property, damage to the environment or natural resources, or "disposal" and "release" of materials associated with the Work (as defined in 42 U.S.C. § 960l et seq.).

9. Termination

9.1. County shall have an absolute right to terminate for default immediately without notice and without an opportunity to cure should Contractor knowingly or recklessly commit a material breach of the terms of the Contract Documents, or any applicable law, on any matter involving the exposure of persons or property to hazardous waste. However, if the breach of contract exposing persons or property to hazardous waste is due solely to an ordinary, unintentional, and non-reckless failure to exercise reasonable care, then the procedures for termination for cause shall apply without modification.

END OF DOCUMENT

DOCUMENT 00 73 56A

PREVIOUS SURVEY REPORTS AND SAMPLING DATA

1. Asbestos Investigation Report, 393 13th Street, Oakland, California, September 2001, by Hygienetics, Inc.
2. County of Alameda miscellaneous Asbestos Sampling Data
3. County of Alameda miscellaneous Lead Sampling Data

ASBESTOS INVESTIGATION REPORT
393 13th STREET
OAKLAND, CALIFORNIA

County Building Number 04640

Prepared For:

County of Alameda
General Services Agency
Oakland, California 94612

Prepared By:

Hygienetics Environmental Services, Inc.
1210 Marina Village Parkway, Suite 104
Alameda, California 94501

September 2001
Final Report

Project Number: 4044.024

H:\4044\024\393RFwd

Hygienetics Environmental

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Appendices

Appendix A - Asbestos Bulk Sample Data

Appendix B - Laboratory Reports/Chain-of-Custody Forms

Appendix C - Hygienetics Consultant Certifications

Appendix D - Floor Plans/Sample Locations

1.0 INTRODUCTION

1.1 Purpose and Objective

Hygienetics Environmental Services, Inc. (Hygienetics) was retained by the Alameda County General Services Agency (GSA) to perform a supplemental survey of the building located at 393 13th Street, Oakland, California (Alameda County Building Number 04640). The purpose of the survey was to identify accessible asbestos-containing building materials in the building using non-destructive sampling protocols. Previous asbestos bulk sample data and recent asbestos abatement (September 2000 to December 2000) was reviewed and incorporated in this report where applicable.

The survey consisted of a visual inspection of the interior and exterior of the building for suspect asbestos-containing building materials (ACBMs). Bulk samples were collected using non-destructive techniques in selected representative locations within the structure and on the roof. The objectives of the survey were to:

- Perform a visual inspection of the building to identify and quantify accessible friable and non-friable suspect ACBMs;
- Collect and analyze bulk samples of suspect materials for asbestos content;
- Ensure the technical quality of all work by using Asbestos Hazard Emergency Response Act (AHERA) accredited Inspectors and Management Planners, and California Certified Asbestos Consultants and Site Surveillance Technicians;
- Consolidate data and findings into a report format;
- Provide schematic floor plans of the building identifying bulk sample locations and confirmed ACBMs;

1.2 Team Members/Survey Dates

The visual inspection and bulk sampling was performed by accredited Environmental Protection Agency (EPA) Asbestos Inspector and California Certified Asbestos Consultant (#97-2258), Dan Gayton. A site inspection was performed by Dan Gayton of Hygienetics on July 31, 2001. The survey report was prepared by Dan Gayton.

1.3 Building Description

The building at 393 13th Street is a three-story building with a basement and a partial mezzanine between the first and second floors. The basement, first, and second floors of the building cover the entire footprint of the property. The building was constructed in 1953. The basement floor contains supply rooms, janitor's lunchroom, electrical closet and a bank vault. The first floor consists of an office, interview booths, conference room, electrical closet, restrooms, and a large open reception area. The mezzanine level between the first and second floors runs in an "L" configuration along the south and east walls of the building. The mezzanine consists of an electrical closet, janitor's closet and is otherwise an open area with tables, chairs and a small library. The second floor consists of offices, cubicles, conference room, kitchen, copy room, electrical closet, supply room and restrooms. The third floor / roof is a partial floor and consists of a kitchen, lunch room area, janitor's closet, restrooms, mechanical equipment room and lobby by the southwest elevator. The third floor lunch room opens out onto the lower roof and there is a small smoking area by the southwest lobby. The combined total building area is approximately 52,750 square feet. The building exterior consists of concrete and stone. The third floor roof is new and is a built-up roof composed of a black fiber mesh over a thick blue foam material. The upper roof sections are built-up rolled roofing. Interior floors are finished with vinyl tile, ceramic tile, and carpet. Interior walls and ceilings are primarily drywall with some sections of plaster mainly in the basement, 1st floor ceiling, and stairwells.

2.0 SURVEY FINDINGS

2.1 Asbestos-Containing Homogeneous Areas

Introduction

Bulk samples of all accessible suspect asbestos-containing materials in identified functional spaces were collected. Samples were collected for each separate homogeneous material. A homogeneous material is defined as a surfacing material, thermal system insulation, or miscellaneous material that is uniform in use, color and texture. A functional space is defined as an spatially distinct unit within a building that contains identifiable populations of building occupants. The functional space concept is helpful in determining the use and occupancy of building areas containing confirmed ACBMs. Knowing the types of occupants and their use of an area may influence the selection of an asbestos management option and/or corrective action. If multiple corrective actions are necessary, the occupancy and use of individual areas may also become important factors when establishing the priority, or ranking, of each corrective action.

Asbestos-Containing Materials

Laboratory analysis indicates that the following homogeneous material types are asbestos-containing:

Homogeneous Area No.	Asbestos-Containing Material	Location
HA001	Roofing material – tar, felt and paper	Upper section of roof / east side of building and south west roof by elevator penthouse
HA002	Roof mastic	Upper section of roof / east side of building and south west roof by elevator penthouse
HA003	High plaster ceiling on 1st floor	1st floor
HA004	Access door to area above 1st floor ceiling	SW stairwell

As summarized in the table above, asbestos-containing materials exist in building at 393 13th Street. The materials are identified by individual floor:

Basement

No asbestos identified on this floor.

First Floor

The high plaster ceiling on the 1st floor is < 1% chrysotile asbestos (~2,800 sq. ft.).

Mezzanine Level

No asbestos identified on this floor.

Second Floor

Insulation in access door located in SW stairwell (~ 3 sq. ft.). A dime size hole of asbestos is exposed on the interior of the door. This should be sealed / repaired so no fibers will become airborne.

Third Floor / Roof

The roofing tar, felt, paper and mastic on the upper east and south side roofs contain 2% chrysotile asbestos (~2,700 sq. ft.). Exact sample locations are not shown on floor plans because records are not available.

The lower level roof outside the lunch room door was reported to have been abated by Bluewater Services, Inc. (Bluewater) in the fall of 2000. No new samples were collected so as not to damage the roof.

2.2 Non-Asbestos Homogeneous Areas

The following materials, except for the plaster, are new materials installed in 2000 and 2001. The previous internal materials, asbestos and non-asbestos, were removed from the building by Bluewater during September 2000 to December 2000.

Homogeneous Area No.	Non-Asbestos Containing Material Description	Location
HA005	4" Black vinyl baseboard and adhesive	Throughout
HA006	2'x2' Ceiling tile and adhesive	Throughout
HA007	2'x4' Ceiling tile and adhesive	Throughout
HA008	12"x12" Vinyl floor tile, marble design, and adhesive	Basement through 2nd floor in supply and electrical closets
HA009	12"x12" Vinyl floor tile, white with brown flecks, and adhesive. Note the 3rd floor lunchroom tile has an additional pattern (black, tan & brown design) but it is still new tile and considered homogeneous with the white tile with brown flecks.	Basement – bank vault and supply rooms, 2nd floor – kitchen, copy room area, electric closet and SW lobby area. 3rd floor – lunch room and SW lobby
HA010	12"x12" Vinyl floor tile, tan, and adhesive	3rd floor janitor closet
HA011	Plaster wall and ceiling	Basement, stairwells, and lobby areas
HA012	Drywall	Throughout
HA013	Ceramic floor and wall tile	Bathrooms throughout
HA014	Carpet glue	Throughout
HA015	Fiberglass insulation on ducting and pipes	Throughout
HA016	Roof / black fiber mesh over thick blue foam	Throughout lower level roof

The 1st floor main lobby area has a granite stone floor and the 1st floor southwest lobby has a green marble stone floor. These flooring materials were not suspect and not tested for asbestos.

2.3 Assumed Asbestos-Containing Materials

Hygienetics did not obtain access to the elevator penthouses. Assume any suspect materials in the elevator penthouses contain asbestos until proven negative by sampling.

This survey is limited to only those materials sampled. If additional materials not listed on this survey are discovered, they should first be sampled prior to disturbance by renovation or demolition activities.

2.4 Clarification of Sampling Issues

Over ~90% of the asbestos was abated from the building. The following table lists the asbestos materials abated from the building by Bluewater in the fall of 2000.

Material Description	Material Location	Approximate Quantity
Black mastic under carpet	Basement and second floor	15,000 SF
Drywall and taping compound	All floors except 1st and 3rd	22,900 SF
Acoustic ceiling plaster	Basement and first floor adjacent to lobby	4,000 SF
	Basement main lobby, first floor entire lower ceiling & elevator lobby by Franklin St.	3,800 SF
Beige linoleum	Under marble pattern floor tile, 3rd floor	1,240 SF
Joint compound on fiberglass insulation	Air handling room / mechanical room	150 SF
Flange on steam heater	Mechanical room	20 LF
Door Insulation	Access door to 1st floor ceiling	3 SF
Heat shield	Light fixture stairwell	5 SF
Mastic on pipe pins	Air handling room / mechanical room	5 SF
4" pipe insulation	Throughout	At least 530 LF

Material Description	Material Location	Approximate Quantity
6" elbow insulation	Throughout	At least 42 LF
6" pipe insulation	Throughout	At least 190 LF
Ceramic restroom floor tile and wainscoating mastic and/or underlying vapor barrier	Basement, 2nd and 3rd floors	3,500 SF
Wainscoating mastic in kitchen	1st floor	500 SF
Wood wall paneling	2nd floor	1,000 SF
Transite flue	Mechanical room	20 LF
All TSI pipe insulation White block type insulation on boiler	Mechanical room	200 LF 280 SF

SF = Square feet
LF = Linear feet

New materials were installed ~2000 and 2001 and GSA requested that Hygienetics not sample these new materials. According to GSA the newly installed materials are non-asbestos. Hygienetics makes no claims about materials that have not been sampled. The Material Safety Data Sheets (MSDS's) for the new materials are on file with GSA.

Positive roof sample results from a past survey are presented in Appendices A & B and on the floor plans.

3.0 SURVEY PROTOCOL

3.1 Field/Analytical Protocol

Visual Inspection

Accessible building materials were visually inspected and sampled using the methods presented in the federal Asbestos Hazard Emergency Response Action (AHERA) regulations (40 CFR, Part 763) as a

guideline. While AHERA is only directly applicable to public schools, the principles presented under the Final Rule are generally accepted as the industry standard for ACBMs inspections.

Hygienetics' on-site inspection was non-destructive in nature. That is, no demolition of building components was performed in order to access hidden materials such as internal wall insulation or pipe chases. While Hygienetics' inspected under carpets for flooring materials, only small sections of carpeting were lifted for investigation. Additional materials may exist under carpeting, especially in the centers of large rooms. Hygienetics makes no warranty as to the possible existence or absence of such materials or to their evaluation in respect to asbestos content. Additional destructive sampling of inaccessible suspect building materials prior to any major renovation or building demolition is required.

Bulk Sampling

Samples were collected using wet methods to minimize fiber or particulate release. The suspect ACBMs were sampled using a knife or other similar coring device suitable to the type of material sampled, to cut through its entire thickness to ensure that a cross-section of the material has been obtained.

The sampled materials were then placed in an appropriately labeled container, which was sealed and submitted to Micro Analytical Laboratories, Inc. (Micro) for asbestos bulk sample analysis and to Hygienetics Analytical Laboratory (HSL) for asbestos quality control analysis. The sampling area was then temporarily sealed with joint compound or silicone sealant (except for flooring materials). A unique sample number using Alameda County's numbering system was assigned to each sample:

04640	County Building Number (not available at sampling time)
73101	Sample Date
HA# (001, 002)	Sequential Homogeneous Area Number
01	Sample number
For example:	73101-001-01

Bulk Sample Analysis

Bulk samples were analyzed by Micro, located in Emeryville, California. The laboratory is accredited under the National Institute of Standards and Technology's National Voluntary Laboratory Accreditation Program (NVLAP), and the State of California Department of Health Services Environmental Laboratory Accreditation Program (ELAP) for the analysis of asbestos bulk material samples.

Quality control asbestos samples were submitted to Hygienetics' internal laboratory, HSL, located in Boston, Massachusetts for analysis. HSL is also accredited under the National Institute of Standards and

Technology's National Voluntary Laboratory Accreditation Program (NVLAP), and the State of California Department of Health Services Environmental Laboratory Accreditation Program (ELAP) for the analysis of asbestos bulk material samples.

Asbestos bulk samples were analyzed using Polarized Light Microscopy with Dispersion Staining (PLM/DS) techniques in accordance with the methodology approved by the U.S. Environmental Protection Agency (EPA). The percentage of asbestos present in the samples was determined on the basis of a visual area estimation. The lower limit of reliable detection for asbestos using the PLM method is approximately one percent (1%) by volume. Certain regulations now define asbestos-containing materials as those materials having an asbestos content of greater than one tenth of one percent (>0.1%).

When "None Detected" (ND) appears in this report, it should be interpreted as meaning no asbestos was observed in the sample material above the reliable limit of detection for the PLM method (1%).

3.2 Limitations

Hygienetics inspected all accessible offices, storage room, janitor rooms, common areas, mechanical spaces, plenums, and roof. Hygienetics did not gain access to the elevator penthouses. It should be noted that this asbestos survey was non-destructive in nature. In addition at the request of GSA, new materials installed in 2000 and 2001 were not sampled. Survey personnel did not use invasive survey techniques to access asbestos-containing materials in pipe shafts, walls, ductwork, confined plenum spaces or beneath non-sampled flooring materials (except carpeting).

4.0 SIGNATURES

This report was prepared by Dan Gayton

Dan Gayton
California Certified Asbestos Consultant
Certification No. 97-2258
Expiration Date: 10-15-01

This report was reviewed by Kris McCormick

Kris McCormick

California Certified Asbestos Consultant
Certification No. 99-2677
Expiration Date: 2-2-02

APPENDIX A

BULK SAMPLE ANALYSIS RESULTS

BULK SAMPLING RESULTS
Alameda County
393 13th Street
Oakland, California
Building No. 04640

Sample I.D. No.	Description	Sample Location	Analysis Results	Approximate Quantity
HA001	Roof – tar, felt and paper			2,700 sq. ft.
031400-784-02A		Roof	ND	
031400-784-02B		Roof	2% CH	
031400-784-02C		Roof	ND	
HA002	Roof matsic			~500 sq. ft.
031400-784-03		Roof	2% CH	
HA003	1st Floor – high plaster ceiling			2,800 sq. ft.
021401-1062-01		SW corner	< 1% CH	
021401-1062-02		SE corner	< 1% CH	
021401-1062-03		NE corner	< 1% CH	
021401-1062-04		NW side	< 1% CH	
021401-1062-05		West center	< 1% CH	
HA004	Debris at bottom of SE air shaft			144 sq. ft.
32001-1062-01		Rear bottom of shaft	ND	
32001-1062-02		Center bottom of shaft	ND	

CH = Chrysotile Asbestos
AM = Amosite Asbestos
ND = No Asbestos Detected
NA = Sample Not Analyzed, (assumed positive)

BULK SAMPLING RESULTS
Alameda County
393 13th Street
Oakland, California
Building No. 04640

Sample I.D. No.	Description	Sample Location	Analysis Results	Approximate Quantity
32001-1062-03		Front bottom of shaft	ND	
HA004	Access Door Insulation			3 sq. ft.
73101-001-01		South west stairwell / access to crawl space above 1st floor ceiling	65% CH	
HA005	Drywall in Basement Electrical Closet			450 sq. ft.
73101-002-02A		Drywall, tape and mud	ND	
73101-002-02B		Drywall, tape and mud	ND	
73101-002-02C		Drywall, tape and mud	ND	
73101-002-02B		Quality control sample / drywall, tape and mud	ND	

CH = Chrysotile Asbestos
AM = Amosite Asbestos
ND = No Asbestos Detected
NA = Sample Not Analyzed, (assumed positive)

APPENDIX B

LABORATORY REPORTS/CHAIN OF CUSTODY FORMS

...GIL...ETIC... EN... SE...CE..., INC. BULK SAMPLE DATA FORM

ACCOUNTABILITY RECORD SHEET ___ OF ___

BLDG. NAME & ADDRESS: 393 13st Oakland Ca

REQUESTED COMPLETION DATE: 03-16-00
JOB NO.: 4044.019 BATCH NO.:
CLIENT NAME: Alameda County
SAMPLER'S NAME: L. Ford
SIGNATURE:
DATE: 03-14-00 TIME COMPLETED: 1230
DELIVERED TO LAB BY:

LAB NAME: EMSL
ADDRESS:
RECEIVED BY: 3/14/2000
DATE: TIME: SIGNATURE:
ANALYZED BY: DATE:
LAB QC APPROVAL:

PROJECT MANAGER'S APPROVAL:

	SAMPLE I.D. NO.	TYPE*	FLOOR NO.	SAMPLE DESCRIPTION AND LOCATION	FUNCTION CODE	TYPE CODE
1	031400784-02A	B	R	Roof Tar & Felt Paper		
2	02B			"		
3	02C			Roof Tar & Felt Paper		
4	03			Mastic Roof		
5	04A			2nd Floor Northeast Drywall mud		
6	04B			" " "		
7	04C			2nd Floor " "		
8	04D			2nd Floor " "		
9	04E			Mezz " "		
10	04F			Mezz " "		
11	04G			Mezz " "		
12	04H			Basement " "		
13	04I			Basement wall drywall mud		

ANALYTICAL LABORATORY RESULTS

	LAB ID. NO	ASBESTOS CONCENTRATIONS** CH	AM	CR	AC	AN	TR	CONCENTRATIONS OF OTHER COMPONENTS FG	MW	CL	SY	HA	NF	OT	SAMPLE COLOR	PC CONC.	NY-PC CONC.	ANALYSIS COMMENTS
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		

ADDITIONAL COMMENTS & NOTES:

***SAMPLE TYPE CODES**

B = BULK MATERIAL
D = DEBRIS SAMPLE
SD/T = SURFACE DUST - TAPE SAMPLE
SD/V = SURFACE DUST - VACUUM SAMPLE
SD/G = SURFACE DUST - GRAB SAMPLE

ASBESTOS TYPE CODES

CH = CHRYSOTILE
AM = AMOSITE
CR = CROCIDOLITE
AC = ACTINOLITE
AN = ANTHOPHYLLITE
TR = TREMOLITE
****CONCENTRATIONS DETERMINED BY VISUAL ESTIMATION TECHNIQUE UNLESS OTHERWISE NOTED**

ABBREVIATIONS FOR OTHER COMPONENTS

FG = FIBERGLASS
MW = MINERAL WOOL
CL = CELLULOSE
SY = SYNTHETIC FIBER
HA = HAIR
NF = NON-FIBEROUS MATERIAL
OT = OTHER
PC = POINT COUNTING
NY-PC = NY STATE POINT COUNTING

CLIENT BILLING INSTRUCTIONS

NO. SAMPLES	RATE	SUBTOTAL
13		

OUTSIDE LAB AUTHORIZATION

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HYGIENETICS ENV. SERVICES, INC. BULK SAMPLE DATA FORM

BLDG. NAME & ADDRESS: 393 13th St Oakland

	SAMPLE I.D. NO.	TYPE*	FLOOR NO.	SAMPLE DESCRIPTION AND LOCATION	FUNCTION CODE	TYPE CODE
1	031400784-05A	B	C	Ceiling/Splice Between #2 + 3 - Plaster		
2	05B			" Coat " " "		
3	05C			" " "		
4	05D			" " "		
5	05E			" " "		
6	06A			Basement Ceiling Acoustic Plaster		
7	06B					
8	06C					
9	06D					
10	06E					
11						
12						
13						

REQUESTED COMPLETION DATE: 03-16-00
JOB NO.: 4044.019 BATCH NO.:
CLIENT NAME: Alameda County
SAMPLER'S NAME: D. Fehr
SIGNATURE: D Fehr
DATE: 03-14-00 TIME COMPLETED: 1230
DELIVERED TO LAB BY:

LAB NAME:
ADDRESS:
RECEIVED BY: A. Attia 3/14/2000 7:00 AM
DATE: TIME: SIGNATURE:
ANALYZED BY: DATE:
LAB QC APPROVAL:

PROJECT MANAGER'S APPROVAL:

ANALYTICAL LABORATORY RESULTS

	LAB ID. NO	ASBESTOS CONCENTRATIONS** CH	AM	CR	AC	AN	TR	CONCENTRATIONS OF OTHER COMPONENTS FG	MW	CL	SY	HA	NF	OT	SAMPLE COLOR	PC CONC.	NY-PC CONC.	ANALYSIS COMMENTS
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		

ADDITIONAL COMMENTS & NOTES:

***SAMPLE TYPE CODES**

B = BULK MATERIAL
D = DEBRIS SAMPLE
SDVT = SURFACE DUST - TAPE SAMPLE
SDVV = SURFACE DUST - VACUUM SAMPLE
SDVG = SURFACE DUST - GRAB SAMPLE

ASBESTOS TYPE CODES

CH = CHRYSOTILE
AM = AMOSITE
CR = CROCIDOLITE
AC = ACTINOLITE
AN = ANTHOPHYLLITE
TR = TREMOLITE
****CONCENTRATIONS DETERMINED BY VISUAL ESTIMATION TECHNIQUE UNLESS OTHERWISE NOTED**

ABBREVIATIONS FOR OTHER COMPONENTS

FG = FIBERGLASS
MW = MINERAL WOOL
CL = CELLULOSE
SY = SYNTHETIC FIBER
HA = HAIR
NF = NON-FIBEROUS MATERIAL
OT = OTHER
PC = POINT COUNTING
NY-PC = NY STATE POINT COUNTING

CLIENT BILLING INSTRUCTIONS

NO. SAMPLES	RATE	SUBTOTAL
10		

OUTSIDE LAB AUTHORIZATION

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Polarized Light Analysis Results

Project AOC003305

Sample Number / Sample Appearance	Client Sample Number	Asbestos: Chrysotile	Amosite	Crocidolite	Anthophyllite	Tremolite	Actinolite	Cellulose	Nonasbestos: Mineral Wool	Fibrous Glass	Synthetic Fibers	Other Fibers	NonFibrous Material	Run Date / Analyst
1708667CPL	031400784-02A	-	-	-	-	-	-	2 %	-	1 %	2 %	-	95 %	3/16/00 SSY
Blk. roofing field ; blk. roofing tar						NFM: Qtz, Tar, Carb, Binder, Opaq, Misc. Part.								Non Homogeneous
1708668CPL	031400784-02B	2 %	-	-	-	-	-	2 %	-	2 %	1 %	-	93 %	3/16/00 SSY
Blk. roofing field ; blk. tar ; blk. felt						NFM: Qtz, Tar, Carb, Binder, Opaq, Misc. Part.								Non Homogeneous
Layer Content:	Felt 60% Chrysotile ; Other Layers: None Detected													
1708669CPL	031400784-02C	-	-	-	-	-	-	2 %	-	1 %	2 %	-	95 %	3/16/00 SSY
Blk. roofing field ; blk. tar						NFM: Qtz, Tar, Carb, Binder, Opaq, Misc. Part.								Non Homogeneous
1708670CPL	031400784-03	2 %	-	-	-	-	-	1 %	-	-	-	-	97 %	3/16/00 SSY
Blk. mastic						NFM: Qtz, Tar, Carb, Binder, Opaq, Misc. Part.								Homogeneous
1708671CPL	031400784-04A	2 %	-	-	-	-	-	<1 %	-	-	-	-	98 %	3/16/00 SSY
Tan mud						NFM: Qtz, Carb, Opaq, Misc. Part.								Homogeneous
1708672CPL	031400784-04B	-	-	-	-	-	-	<1 %	-	-	-	-	99+ %	3/16/00 SSY
Wht. mud						NFM: Qtz, Carb, Opaq, Misc. Part.								Homogeneous

Samples received on: Wednesday, March 15, 2000

Authorized Signature

Stephen S. Yata, Geologist

Date Thursday, March 16, 2000

RJ Lee Group, Inc.
Bay Area Lab

530 McCormick Street
San Leandro, CA 94577

Phone (510) 567-0480
Fax (510) 567-0488

Polarized Light Analysis Results

Project AOC003305

Sample Number / Sample Appearance	Client Sample Number	Asbestos: Chrysotile	Amosite	Crocidolite	Anthophyllite	Tremolite	Actinolite	Cellulose	Nonasbestos: Mineral Wool	Fibrous Glass	Synthetic Fibers	Other Fibers	NonFibrous Material	Run Date / Analyst
1708673CPL Wht. mud	031400784-04C	-	-	-	-	-	-	<1 %	-	-	-	-	99+ %	3/16/00 SSY
						NFM: Qtz, Carb, Opaq, Misc. Part.								Homogeneous
1708674CPL Tan mud	031400784-04D	>1 %	-	-	-	-	-	<1 %	-	-	-	-	99 %	3/16/00 SSY
						NFM: Qtz, Carb, Opaq, Misc. Part.								Non Homogeneous
1708675CPL Wht. mud	031400784-04E	-	-	-	-	-	-	<1 %	-	-	-	-	99+ %	3/16/00 SSY
						NFM: Qtz, Carb, Opaq, Misc. Part.								Homogeneous
1708676CPL Tan mud ; wht. drywall ; brn. mastic	031400784-04F	<1 %	-	-	-	-	-	<1 %	-	-	-	-	99+ %	3/16/00 SSY
						NFM: , Misc. Part.								Non Homogeneous
Layer Content:	Mud >1% Chrysotile ; Other Layers: None Detected													
1708677CPL Wht. mud	031400784-04G	-	-	-	-	-	-	3 %	-	-	-	-	97 %	3/16/00 SSY
						NFM: Qtz, Carb, Opaq, Misc. Part.								Homogeneous
1708678CPL Wht. plaster ; mud - NS	031400784-04H	-	-	-	-	-	-	-	-	-	-	-	100 %	3/16/00 SSY
						NFM: Qtz, Per, Carb, Binder, Opaq, Misc. Part.								Homogeneous

Samples received on: Wednesday, March 15, 2000

Authorized Signature

Stephen S. Yata, Geologist

Date: Thursday, March 16, 2000

RJ Lee Group, Inc.
Bay Area Lab

530 McCormick Street
San Leandro, CA 94577

Phone (510) 567-0480
Fax (510) 567-0488

Polarized Light Analysis Results

Project AOC003305

Sample Number / Sample Appearance	Client Sample Number	Asbestos: Chrysotile	Amosite	Crocidolite	Anthophyllite	Tremolite	Actinolite	Cellulose	Nonasbestos: Mineral Wool	Fibrous Glass	Synthetic Fibers	Other Fibers	NonFibrous Material	Run Date / Analyst
1708679CPL Wht. drywall ; tan plaster	031400784-04I	-	-	-	-	-	-	-	-	-	-	-	100 % NFM: Qtz, Per, Carb, Binder, Opaq, Misc. Part. Non Homogeneous	3/16/00 SSY
1708680CPL Offwht. plaster	031400784-05A	-	-	-	-	-	-	-	-	-	-	-	100 % NFM: Qtz, Carb, Ver, Opaq, Gyp, Mica, Misc. Part. Homogeneous	3/16/00 SSY
1708681CPL Offwht. plaster	031400784-05B	-	-	-	-	-	-	-	-	-	-	-	100 % NFM: Qtz, Carb, Ver, Opaq, Gyp, Mica, Misc. Part. Homogeneous	3/16/00 SSY
1708682CPL Wht. plaster ; offwht. plaster	031400784-05C	-	-	-	-	-	-	-	-	-	-	-	100 % NFM: Qtz, Per, Carb, Binder, Opaq, Gyp, Mica, Misc. Part. Non Homogeneous	3/16/00 SSY
1708683CPL Wht. plaster	031400784-05D	-	-	-	-	-	-	-	-	-	-	-	100 % NFM: Qtz, Carb, Ver, Opaq, Gyp, Mica, Misc. Part. Homogeneous	3/16/00 SSY
1708684CPL wht. plaster	031400784-05E	-	-	-	-	-	-	-	-	-	-	-	100 % NFM: Qtz, Per, Carb, Binder, Opaq, Misc. Part. Homogeneous	3/16/00 SSY

Samples received on: Wednesday, March 15, 2000

Authorized Signature: _____

Stephen S. Yata, Geologist

Date: Thursday, March 16, 2000

RJ Lee Group, Inc.
Bay Area Lab

530 McCormick Street
San Leandro, CA 94577

Phone (510) 567-0480
Fax (510) 567-0488

Polarized Light Analysis Result

Project AOC003305

Sample Number / Sample Appearance	Client Sample Number	Asbestos: Chrysotile	Amosite	Crocidolite	Anthophyllite	Tremolite	Actinolite	Cellulose	Nonasbestos: Mineral Wool	Fibrous Glass	Synthetic Fibers	Other Fibers	NonFibrous Material	Run Date / Analyst
1708685CPL Wht. acoustic material	031400784-06A	<1 %	-	-	-	-	-	-	-	-	-	-	99+ %	3/16/00 SSY
						NFM: Qtz, Per, Carb, Binder, Opaq, Misc. Part.								Homogeneous
1708686CPL Wht. acoustic material	031400784-06B	<1 %	-	-	-	-	-	-	-	-	-	-	99+ %	3/16/00 SSY
						NFM: Qtz, Per, Carb, Binder, Opaq, Misc. Part.								Homogeneous
1708687CPL Wht. acoustic material	031400784-06C	<1 %	-	-	-	-	-	-	-	-	-	-	99+ %	3/16/00 SSY
						NFM: Qtz, Per, Carb, Binder, Opaq, Misc. Part.								Homogeneous
1708688CPL Wht. acoustic plaster	031400784-06D	<1 %	-	-	-	-	-	-	-	-	-	-	99+ %	3/16/00 SSY
						NFM: Qtz, Per, Carb, Binder, Opaq, Misc. Part.								Homogeneous
1708689CPL Wht. acoustic plaster	031400784-06E	<1 %	-	-	-	-	-	-	-	-	-	-	99+ %	3/16/00 SSY
						NFM: Qtz, Per, Carb, Binder, Opaq, Misc. Part.								Homogeneous

Samples received on: Wednesday, March 15, 2000

Authorized Signature

Stephen S. Yata, Geologist

Date Thursday, March 16, 2000

RJ Lee Group, Inc.
Bay Area Lab

530 McCormick Street
San Leandro, CA 94577

Phone (510) 567-0480
Fax (510) 567-0488

ASBESTOS BULK SAMPLE DATA FORM

PROJECT: 393 13TH ST, OAKLAND, CA / AIR SHAFT DEBRIS

	SAMPLE ID NO.	TYPE*	FLOOR #	DESCRIPTION OF SAMPLING LOCATION & COMMENTS	GROUP
1	32001-1052-01	B	1	REAR BOTTOM OF S.E. AIR SHAFT / DEBRIS	
2	-02	↓	1	CENTER " " " " " / ↓	
3	-03	↓	1	FRONT " " " " " / ↓	
4					
5					
6					
7					
8					
9					
10					
11					
12					

ACCOUNTABILITY RECORD | PAGE 1 OF 1

REQUESTED COMPLETION DATE: 3/21/01 ASAP

JOB NO.: 4044.022 BATCH: SF-13047

CLIENT NAME: G.S.A. - ALAMEDA

SAMPLER'S NAME: D. DAYTON

SIGNATURE: D. Dayton

DATE: 3/20/01 TIME:

METHOD OF SHIPMENT: FED-EX

LAB NAME: HES

ADDRESS:

RECEIVED BY:

DATE: TIME: SIGNATURE:

ANALYST: [signature] DATE: 3-21-01

LAB QC APPROVAL: [signature]

☐ ANALYZE TO FIRST POSITIVE BY GROUP ☒ FAX REPORT

☒ PRINTED REPORT REQUIRED ☐ E-MAIL REPORT

PLM ANALYTICAL LABORATORY RESULTS

	LAB ID NO.	ASBESTOS CONCENTRATIONS**						CONCENTRATIONS OF OTHER COMPONENTS							SAMPLE COLOR	PC CONC	NY-PC CONC	CA-PC CONC	ANALYSIS COMMENTS
		CH	AM	CR	AC	AN	TR	FG	MW	CL	SY	HA	NF	OT					
1	0913047-001									✓			✓		Gray				
2	002									✓			✓		Gray				
3	003									✓			✓		Gray				
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			

ADDITIONAL COMMENTS:

***SAMPLE TYPE CODES**

B = BULK MATERIAL
D = DUSTING SAMPLE
SDT = SURFACE DUST—TAPE SAMPLE
SDV = SURFACE DUST—VACUUM SAMPLE
SDG = SURFACE DUST—GRAB SAMPLE

ASBESTOS TYPE CODES

CH = CHRYSOTILE
AM = AMOSITE
CR = CROCIDOLITE
AC = ACTINOLITE
AN = ANTHOPHYLLITE
TR = TREMOLITE

**"CONCENTRATIONS DETERMINED BY CALIBRATED VISUAL ESTIMATION TECHNIQUE UNLESS OTHERWISE NOTED

ABBREVIATIONS FOR OTHER COMPONENTS

FG = FIBERGLASS
MW = MINERAL WOOL
CL = CELLULOSE
SY = SYNTHETIC FIBER
HA = HAIR
NF = NON-FIBROUS MATERIAL
OT = OTHER

PC = POINT COUNTING
NY-PC = NEW YORK STATE POINT COUNTING
CA-PC = CALIFORNIA STATE POINT COUNTING

NO. OF SAMPLES SUBMITTED: 3 RATE: $10

CONFIRMATION NO.:

WHITE (ORIGINAL) SHEET — LABORATORY YELLOW SHEET — FIELD OFFICE

REV. 07/2000

SBESTOS BULK SAMPLE DATA FORM

ACCOUNTABILITY RECORD | PAGE 1 OF 1

ROJECT: 343 13TH ST, OAKLAND, CA. HIGH CEILING 1ST FLOOR.

SAMPLE ID NO.	TYPE*	FLOOR #	DESCRIPTION OF SAMPLING LOCATION & COMMENTS	GROUP
021401-1002 - 01	B	1	PLASTER / HIGH CEILING 1ST. FLOOR	
02				
03				
04				
05				

REQUESTED COMPLETION DATE: 2/15/01
JOB NO.: 4044.020 / BATCH: SF-12491
CLIENT NAME: G.S.A. ALAMEDA
SAMPLER'S NAME: D. Dayton
SIGNATURE: D. Dayton
DATE: 2/14/01 TIME:
METHOD OF SHIPMENT: FED-EX
LAB NAME: HASL
ADDRESS: BOSTON
RECEIVED BY: BOB BOSAZ
DATE: 2/15/01 TIME: 3:00 SIGNATURE:
ANALYST: DATE: 02.15.01
LAB QC APPROVAL:
☐ ANALYZE TO FIRST POSITIVE BY GROUP ☒ FAX REPORT
☒ PRINTED REPORT REQUIRED ☐ E-MAIL REPORT

PLM ANALYTICAL LABORATORY RESULTS

	LAB ID NO.	ASBESTOS CONCENTRATIONS**						CONCENTRATIONS OF OTHER COMPONENTS							SAMPLE COLOR	PC CONC	NY-PC CONC	CA-PC CONC	ANALYSIS COMMENTS
		CH	AM	CR	AC	AN	TR	FG	MV	CL	SY	HA	NF	OT					
1	091299I-001	<1											100		GY				
2	002	<1											100		GY				
3	003	<1											100		GY				
4	004	<1											100		GY				
5	005	<1											100		GY				
6																			
7																			
8																			
9																			
10																			
11																			
12																			

ADDITIONAL COMMENTS:

*SAMPLE TYPE CODES
B = BULK MATERIAL
C = CORE SAMPLE
SWT = SURFACE DUST—TAPE SAMPLE
SWV = SURFACE DUST—VACUUM SAMPLE
SWG = SURFACE DUST—GRAB SAMPLE

ASBESTOS TYPE CODES
CH = CHRYSOTILE
AM = AMOSITE
CR = CROCIDOLITE
AC = ACTINOLITE
AN = ANTHOPHYLLITE
TR = TREMOLITE
**CONCENTRATIONS DETERMINED BY CALIBRATED VISUAL ESTIMATION TECHNIQUE UNLESS OTHERWISE NOTED

ABBREVIATIONS FOR OTHER COMPONENTS
FG = FIBERGLASS
MV = MINERAL WOOL
CL = CELLULOSE
SY = SYNTHETIC FIBER
HA = HAIR
NF = NON-FIBROUS MATERIAL
OT = OTHER
PC = PHASE CONTRAST
NY-PC = NEW YORK STATE PCM EQUIVALENT
CA-PC = CALIFORNIA STATE PCM COUNTING

NO. OF SAMPLES SUBMITTED: 5 | RATE
CONFIRMATION NO.:

WHITE (ORIGINAL) SHEET — LABORATORY YELLOW SHEET — FIELD OFFICE

REV. 07/2000

10/11

(26.15)

ASBESTOS BULK SAMPLE DATA FORM

ACCOUNTABILITY RECORD | PAGE 1 OF 1

PROJECT: 393 17TH ST, OAKLAND, CA

REQUESTED COMPLETION DATE: 8/3/01

JOB NO.: 4044.024 | BATCH: - N/A

CLIENT NAME: GENERAL SERVICES AGENCY

SAMPLER'S NAME: DAN DAYTON - ALAMEDA

SIGNATURE: Dan Dayton

DATE: 7/31/01 TIME:

METHOD OF SHIPMENT: DROP OFF

LAB NAME: MILLO ANALYTICAL

ADDRESS:

RECEIVED BY: Lily Sin

DATE: 8/1/1 TIME: 3:45pm SIGNATURE:

ANALYST: DATE:

LAB QC APPROVAL:

☐ ANALYZE TO FIRST POSITIVE BY GROUP ☒ FAX REPORT

☒ PRINTED REPORT REQUIRED ☑ E-MAIL REPORT

	SAMPLE ID NO.	TYPE*	FLOOR #	DESCRIPTION OF SAMPLING LOCATION & COMMENTS	GROUP
1	73101-001-01	B	2	CRAWL SPACE ACCESS DOOR INSULATION	
2	73101-002-02A	B	BASEMENT	BASEMENT ELECTRICAL CLOSET / DRYWALL TAPE+MUD	
3	-02B	B	↓	↓	
4	-02C	B	↓	↓	
5					
6					
7					
8					
9					
10					
11					
12					

PLM ANALYTICAL LABORATORY RESULTS

	LAB ID NO.	ASBESTOS CONCENTRATIONS**						CONCENTRATIONS OF OTHER COMPONENTS							SAMPLE COLOR	PC CONC	NY-PC CONC	CA-PC CONC	ANALYSIS COMMENTS
		CH	AM	CR	AC	AN	TR	FG	MW	CL	SY	HA	NF	OT					
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			

ADDITIONAL COMMENTS: PLEASE BILL; GSA-ALAMEDA, 1401 LAKESIDE DRIVE, 11TH FL, OAKLAND, CA 94612. PHONE JASON 208-9520

*SAMPLE TYPE CODES	ASBESTOS TYPE CODES	ABBREVIATIONS FOR OTHER COMPONENTS	NO. OF SAMPLES SUBMITTED	RATE
B = BULK MATERIAL D = DEBRIS SAMPLE SDT = SURFACE DUST—TAPE SAMPLE SDV = SURFACE DUST—VACUUM SAMPLE SDG = SURFACE DUST—GRAB SAMPLE	CH = CHRYSOTILE AM = AMOSITE CR = CROCIDOLITE AC = ACTINOLITE AN = ANTHOPHYLLITE TR = TREMOLITE **CONCENTRATIONS DETERMINED BY CALIBRATED VISUAL ESTIMATION TECHNIQUE UNLESS OTHERWISE NOTED	FG = FIBERGLASS MW = MINERAL WOOL CL = CELLULOSE SY = SYNTHETIC FIBER HA = HAIR NF = NON FIBROUS MATERIAL OT = OTHER PC = POINT COUNTING NY PC = NEW YORK STATE POINT COUNTING CA-PC = CALIFORNIA STATE POINT COUNTING		
			CONFIRMATION NO.:	

WHITE (ORIGINAL) SHEET — LABORATORY YELLOW SHEET — FIELD OFFICE REV. 07/2000

MICRO ANALYTICAL LABORATORIES, INC.

BULK ASBESTOS ANALYSIS BY PLM

AUG 06 2001

1051

Hygienetics Environmental
1210 Marina Village Pkwy.
Suite 104
Alameda, CA 94501

PROJECT:
GENERAL SERVICES AGENCY
393 13TH STREET
OAKLAND, CA
JOB NO. 4044.024

Micro Log In 26515
Total Samples 4
Date Sampled 08/01/2001
Date Received 08/01/2001
Date Analyzed 08/01/2001

SAMPLE INFORMATION	ASBESTOS INFORMATION QUANTITY (AREA %) / TYPES / LAYERS / DISTINCT SAMPLES	OTHER MATERIALS
Client: 73101-001-01 Micro: 26515-01 Analyst: GR 2ND FLOOR CRAWLSPACE ACCESS DOOR INSULATION	65 % CHRYSOTILE	10 % CELLULOSE ROCK FRAGMENTS OPAQUES
Client: 73101-002-02A Micro: 26515-02 Analyst: GR BASEMENT ELECTRICAL CLOSET DRYWALL TAPE & MUD	DRYWALL: ND MUD: ND PAINT: ND TAPE: ND	35 % CELLULOSE GYPSUM CARBONATE
Client: 73101-002-02B Micro: 26515-03 Analyst: GR BASEMENT ELECTRICAL CLOSET DRYWALL TAPE & MUD	DRYWALL: ND MUD: ND PAINT: ND	20 % CELLULOSE GYPSUM CARBONATE
Client: 73101-002-02C Micro: 26515-04 Analyst: GR BASEMENT ELECTRICAL CLOSET DRYWALL TAPE & MUD	DRYWALL: ND MUD: ND PAINT: ND TAPE: ND	30 % CELLULOSE GYPSUM CARBONATE

Technical Supervisor: _____ 8/1/2001
Baojia Ke, Ph. D. Date Reported

Method: Polarized Light Microscopy (PLM), EPA/600/R-93/116, 1993. ND: None detected by the PLM method. Units: area percent. Weight percent cannot be determined by PLM visual estimation or point counting. Asbestos fibers with diameter below the PLM resolution limit cannot be detected by PLM. The absence of asbestos in dust samples (including wipe or microvacuum), and in some non-friable materials, including floor tiles, cannot be conclusively established by PLM, and should be independently confirmed by Transmission Electron Microscopy (TEM). Only dominant non-fibrous materials are indicated; other miscellaneous particles are present in most samples. This report must not be interpreted as a conclusive identification of non-asbestos components, fibrous or non-fibrous. Preparation (all samples): grinding, milling; teasing bundles apart; drying, if needed, by hotplate heating. Acid dissolution, ashing, or other techniques may be applied to some complicated samples; if so, it is noted in the report. Various sample interferences may hinder determination of some optical properties of fibers. Notes are made if point counting is used; otherwise, asbestos is quantified by calibrated visual estimation. The detection limit is material dependent. Detection of traces of asbestos (<1%) may not be reliable or reproducible by PLM. The lower quantitation limit (reporting limit) of PLM estimation is 1%. The 95% UCL and LCL (Upper and Lower Confidence Limits) represent the highest and lowest expected concentrations for a given asbestos point count, based on the reported concentration and Poisson statistics. The MCL (Maximum Contaminant Level), per CCR Title 22, Sec. 66261.24(a)(2)(A), is 1.0% asbestos. The Cal-OSHA definition of asbestos-containing construction material is 0.1% asbestos by weight; however, reliable determination of asbestos weight percent at this level cannot be done by PLM, and requires TEM re-analysis. Individual layers of heterogeneous samples are analyzed separately; asbestos percentages are reported for individual layers. Interlayer contamination is possible among all layers in a sample. Composite asbestos percentages on multilayered samples are applicable only to layered wall systems (wallboard, joint compound, and related materials); compositing is based on clients' descriptions of a material as "joint compound". Clients are solely responsible for identification and description of bulk materials listed on field forms. Laboratory sample descriptions may differ from descriptions given by the client. *Quality Control (QC) Codes: A = all materials confirmed (re-analysis within acceptance limits); B = no asbestos detected in lab blank (NIST SRM 1866a Fibrous Glass or equivalent); R = all materials confirmed after multiple result resolutions. NIST / NVLAP Accreditation Lab Code: #101872-0. California ELAP Certification #1037. This report must not be used to claim product endorsement by NIST or any U.S. Government agency. This report must not be reproduced except in full, with the approval of Micro Analytical Laboratories, Inc. This report pertains only to the listed samples, as submitted to and analyzed by Micro Analytical Laboratories, Inc. and must not be interpreted as a hazard assessment or as a representation of any material in the field N/A = Not Applicable.

ASBESTOS BULK SAMPLE DATA FORM

ACCOUNTABILITY RECORD | PAGE 1 OF 1

PROJECT: 393 13TH ST., OAKLAND, CA

REQUESTED COMPLETION DATE: 8/6/01

JOB NO.: 4044.024 BATCH: SF-13257

CLIENT NAME: GSA - ALAMEDA

SAMPLER'S NAME: DAN SAYTON

SIGNATURE: Don Sayton

DATE: 8/1/01 TIME:

METHOD OF SHIPMENT: FED-EX

LAB NAME: HES

ADDRESS: 18 Mulholland Dr. Blvd

RECEIVED BY: Karen E Nelson SIGNATURE:

DATE: 8/2/01 TIME: 1655

ANALYST: DATE: 8-2-01

LAB QC APPROVAL:

[ ] ANALYZE TO FIRST POSITIVE BY GROUP [ ] FAX REPORT

[ ] PRINTED REPORT REQUIRED [ ] E-MAIL REPORT

	SAMPLE ID NO.	TYPE*	FLOOR #	DESCRIPTION OF SAMPLING LOCATION & COMMENTS	GROUP
1	73101-002-02B	B	BASEMENT	DTM / BASEMENT ELECTRICAL CLOSET	
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

PLM ANALYTICAL LABORATORY RESULTS

	LAB ID NO.	ASBESTOS CONCENTRATIONS**						CONCENTRATIONS OF OTHER COMPONENTS							SAMPLE COLOR	PC CONC	NY-PC CONC	CA-PC CONC	ANALYSIS COMMENTS
		CH	AM	CR	AC	AN	TR	FG	MW	CL	SY	HA	NF	OT					
1	0913257-001									40			60		WH/BR				
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			

ADDITIONAL COMMENTS:

***SAMPLE TYPE CODES**

B = BULK MATERIAL
D = DEBRIS SAMPLE
SDT = SURFACE DUST—TAPE SAMPLE
SDV = SURFACE DUST—VACUUM SAMPLE
SDG = SURFACE DUST—GRAB SAMPLE

ASBESTOS TYPE CODES

CH = CHRYSOTILE
AM = AMOSITE
CR = CROCIDOLITE
AC = ACTINOLITE
AN = ANTHOPHYLLITE
TR = TREMOLITE

**CONCENTRATIONS DETERMINED BY CALIBRATED VISUAL ESTIMATION TECHNIQUE UNLESS OTHERWISE NOTED

ABBREVIATIONS FOR OTHER COMPONENTS

FG = FIBERGLASS
MW = MINERAL WOOL
CL = CELLULOSE
SY = SYNTHETIC FIBER
HA = HAIR
NF = NON-FIBROUS MATERIAL
OT = OTHER

PC = POINT COUNTING
NY-PC = NEW YORK STATE POINT COUNTING
CA-PC = CALIFORNIA STATE POINT COUNTING

NO. OF SAMPLES SUBMITTED	RATE
1	

CONFIRMATION NO.:

WHITE (ORIGINAL) SHEET — LABORATORY YELLOW SHEET — FIELD OFFICE

REV. 07/2000

APPENDIX C

SURVEY TEAM CERTIFICATIONS

State of California
Division of Occupational Safety and Health

Certified Asbestos Consultant

Daniel Joseph Gayton, Jr.

Name

Certification No. **97-2258**

Expires on **10/15/2001**

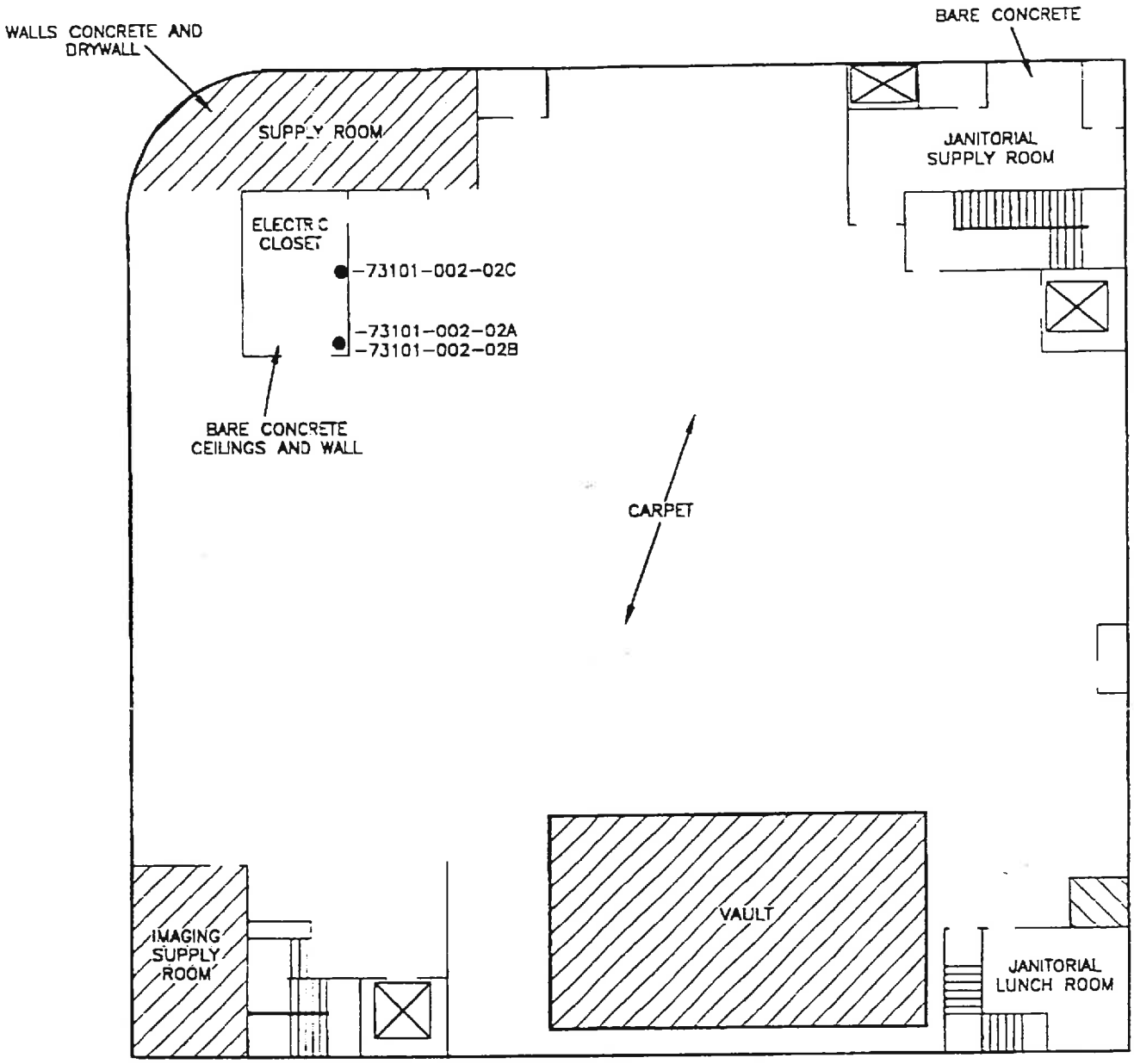
This certification was issued by the Division of Occupational Safety and Health as authorized by Sections 7180 et seq. of the Business and Professions Code

APPENDIX D

FLOOR PLANS

SAMPLE LOCATIONS/MATERIAL LOCATIONS

Dan 6 pages



LEGEND

= 12"x12" FLOOR TILE WHITE WITH BROWN FLECKS

= 12"x12" FLOOR TIL, WHITE MARBLE DESIGN

-73101-002-02C ● = SAMPLE LOCATION

4" BLACK BASEBOARDS THROUGHOUT BASEMENT

2'x2' C.T. THROUGHOUT

JANITORS LUNCH ROOM:

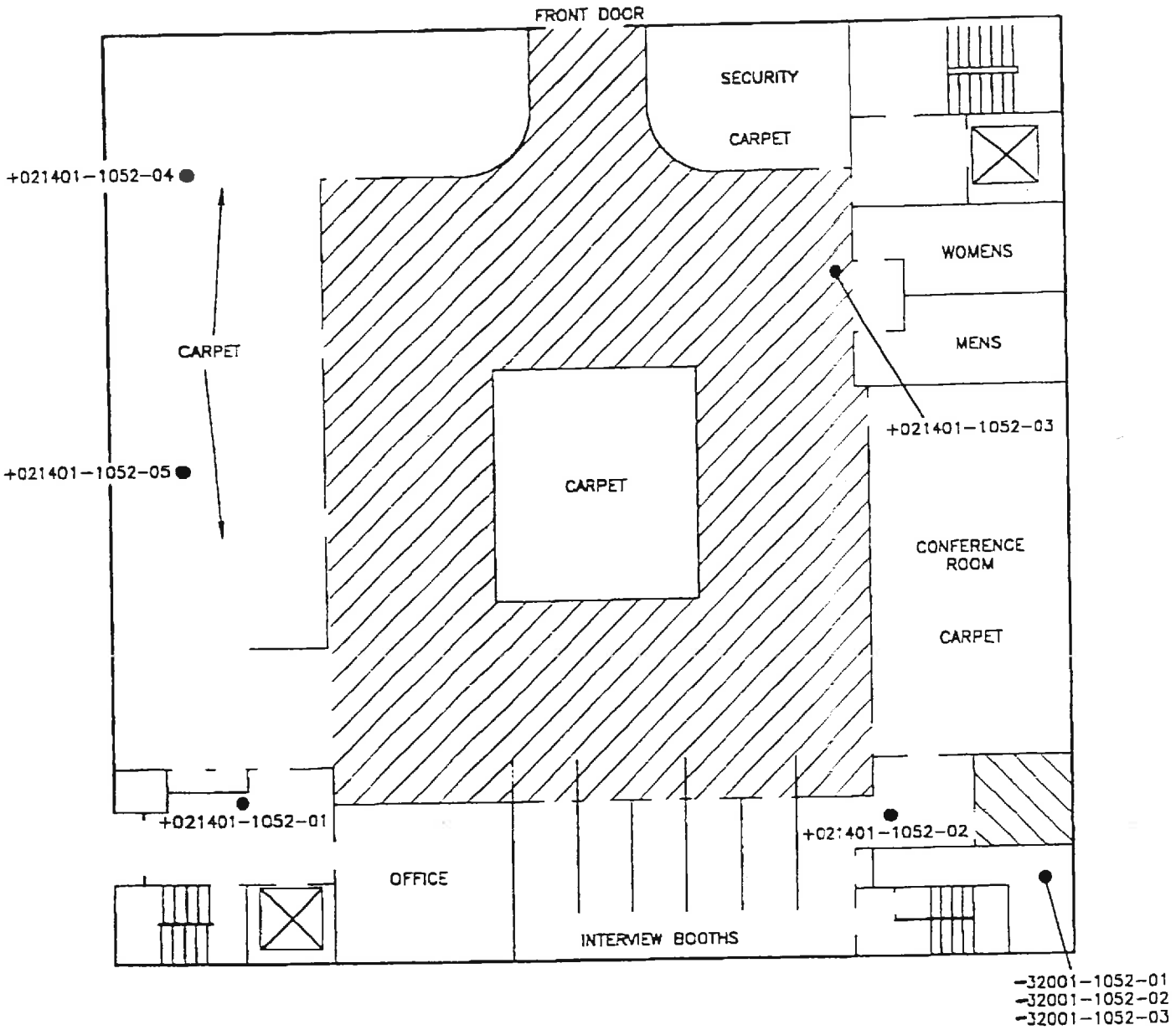
CARPET

CEILINGS AND WALLS PLASTER

N

Drawing not to scale

Hygienetics Environmental 1210 Marina Village Parkway, Suite 104 Alameda, California 94501	BASEMENT County Building No. 04640 393 13th Street Oakland, California	PROJECT NO. 4044.024 / DRAWN BY EC REPORT DATE August 2001	PLATE 1



LEGEND

= GRANITE BLOCK FLOOR

= 12"x12" FLOOR TILE WHITE MARBLE DESIGN

+021401-1052-01 = SAMPLE LOCATION

4" BLACK BASEBOARDS THROUGHOUT

2'x2' C.T. ALL OFFICES

BATH CEILING HARD DRYWALL

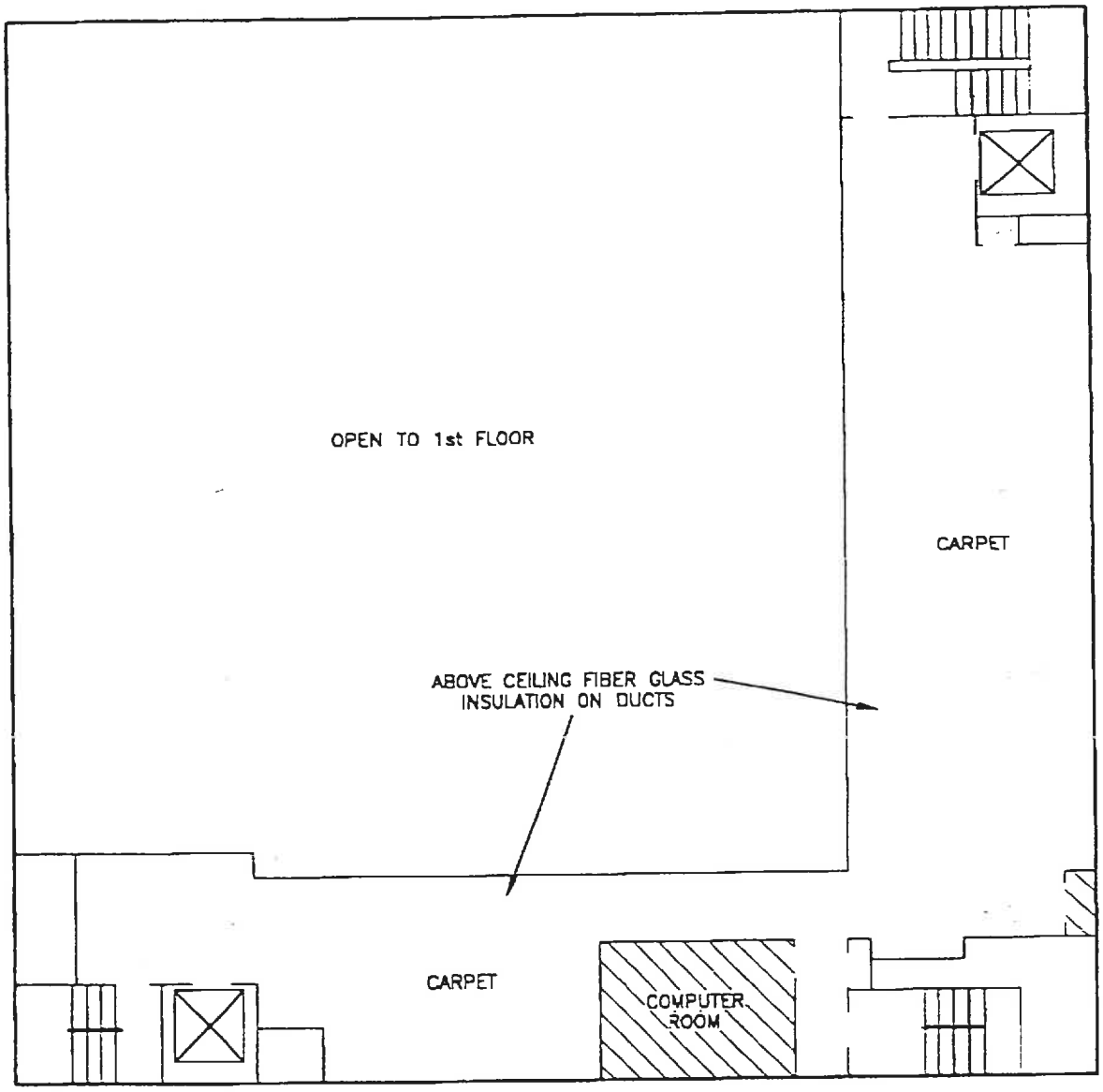
12"x12" TAN CERAMIC TILE,
1/2 WALL CERAMIC TILE AND DRYWALL

HIGH PLASTER CEILING IS ASBESTOS <1%

N

Drawing not to scale

Hygienetics Environmental 1210 Marina Village Parkway, Suite 104 Alameda, California 94501	FIRST FLOOR County Building No. 04640 393 13th Street Oakland, California	PROJECT NO. 4044.024	DRAWN BY EC
		REPORT DATE August 2001	PLATE 2



LEGEND

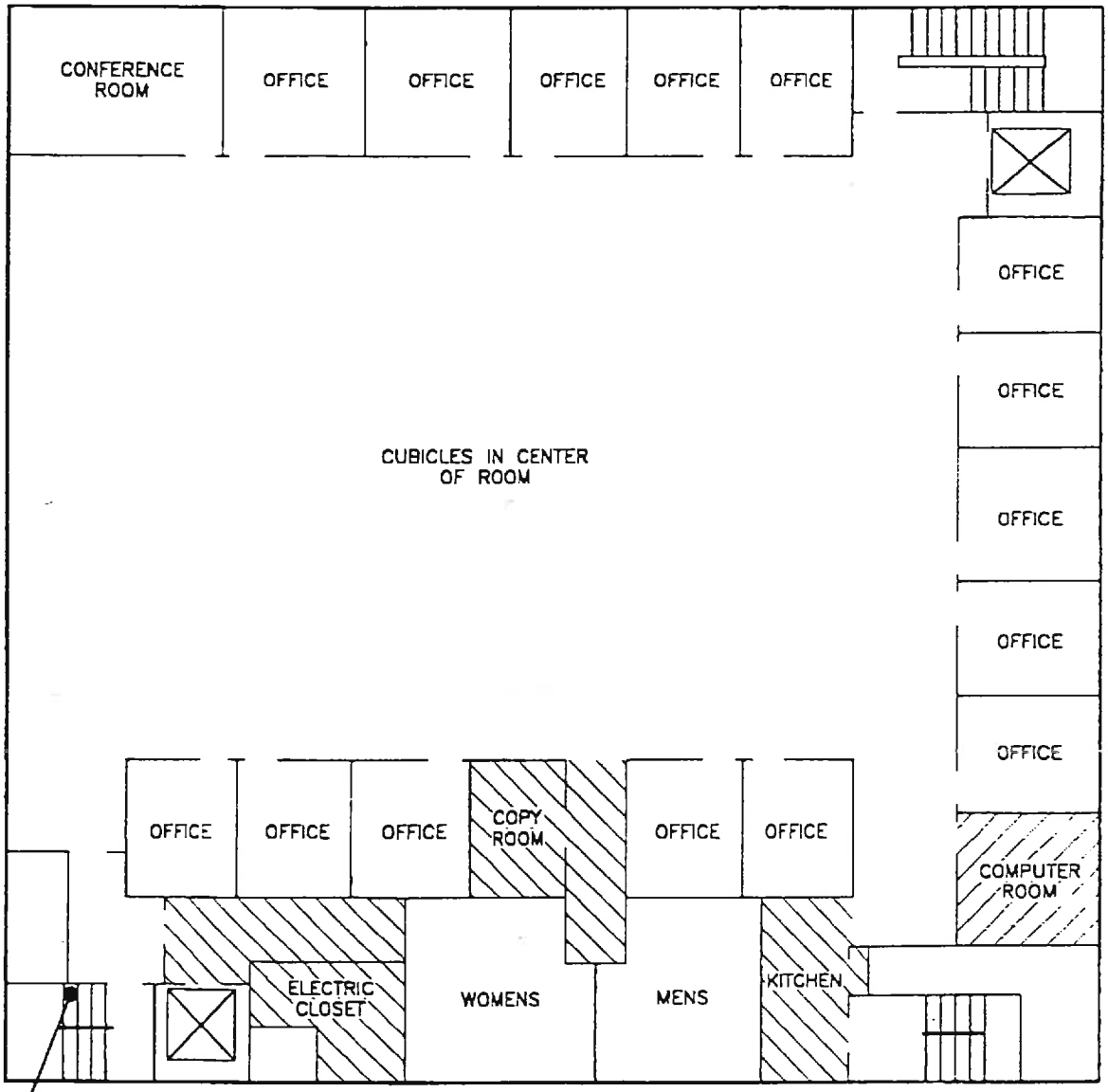
= 12"x12" FLOOR TILE WHITE MARBLE DESIGN

4" BLACK BASEBOARDS THROUGHOUT
2"x2" C.T. THROUGHOUT
CARPET ON CONCRETE

N

Drawing not to scale

Hygienetics Environmental 1210 Marina Village Parkway, Suite 104 Alameda, California 94501	MEZZANINE County Building No. 04640 393 13th Street Oakland, California	PROJECT NO. 4044.024 / DRAWN BY EC / REPORT DATE August 2001	PLATE 3



LEGEND

= 12"x12" FLOOR TILE WHITE MARBLE DESIGN

= 12"x12" FLOOR TILE WHITE WITH BROWN FLECKS

+73101-C01-01 ● = SAMPLE LOCATION

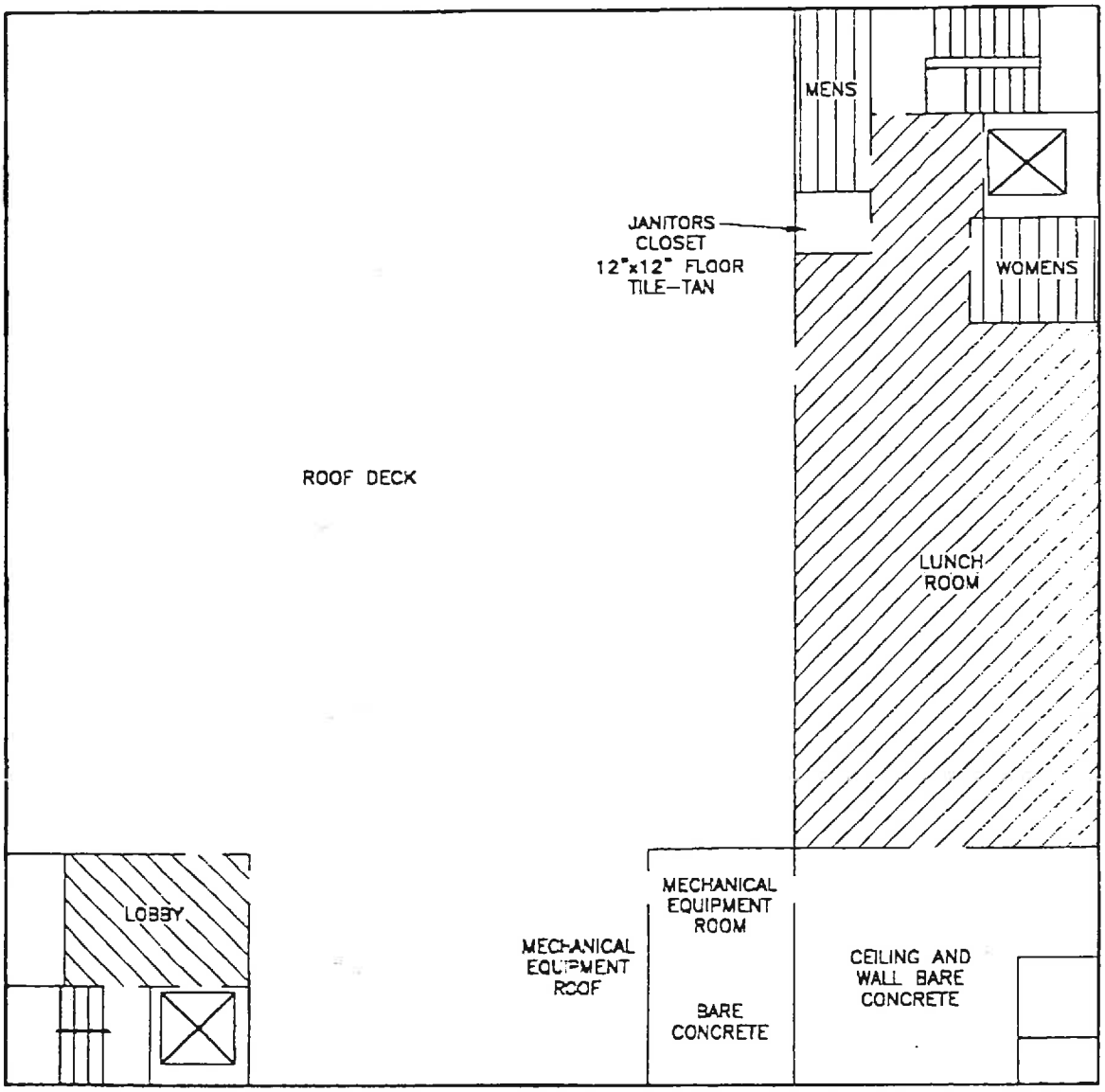
4" BLACK BASEBOARDS THROUGHOUT

BATHS HAVE 12"x12" CERAMIC FLOOR TILE. 1/2 WALLS CERAMIC TILE. HARD CEILINGS IN BATHS.

N

Drawing not to scale

Hygienetics Environmental 1210 Marina Village Parkway, Suite 104 Alameda, California 94501	SECONG FLOOR County Building No. 04640 393 13th Street Oakland, California	PROJECT NO. 4044.024 / DRAWN BY EC REPORT DATE August 2001	PLATE 4



LEGEND

= 12"x12" FLOOR TILE WHITE WITH BROWN FLECKS AND INTERMITANT YELLOW, TAN, AND BLACK BLOCKS

= 12"x12" CERAMIC TILE TAN

= 12"x12" FLOOR TILE WHITE WITH MARBLE DESIGN

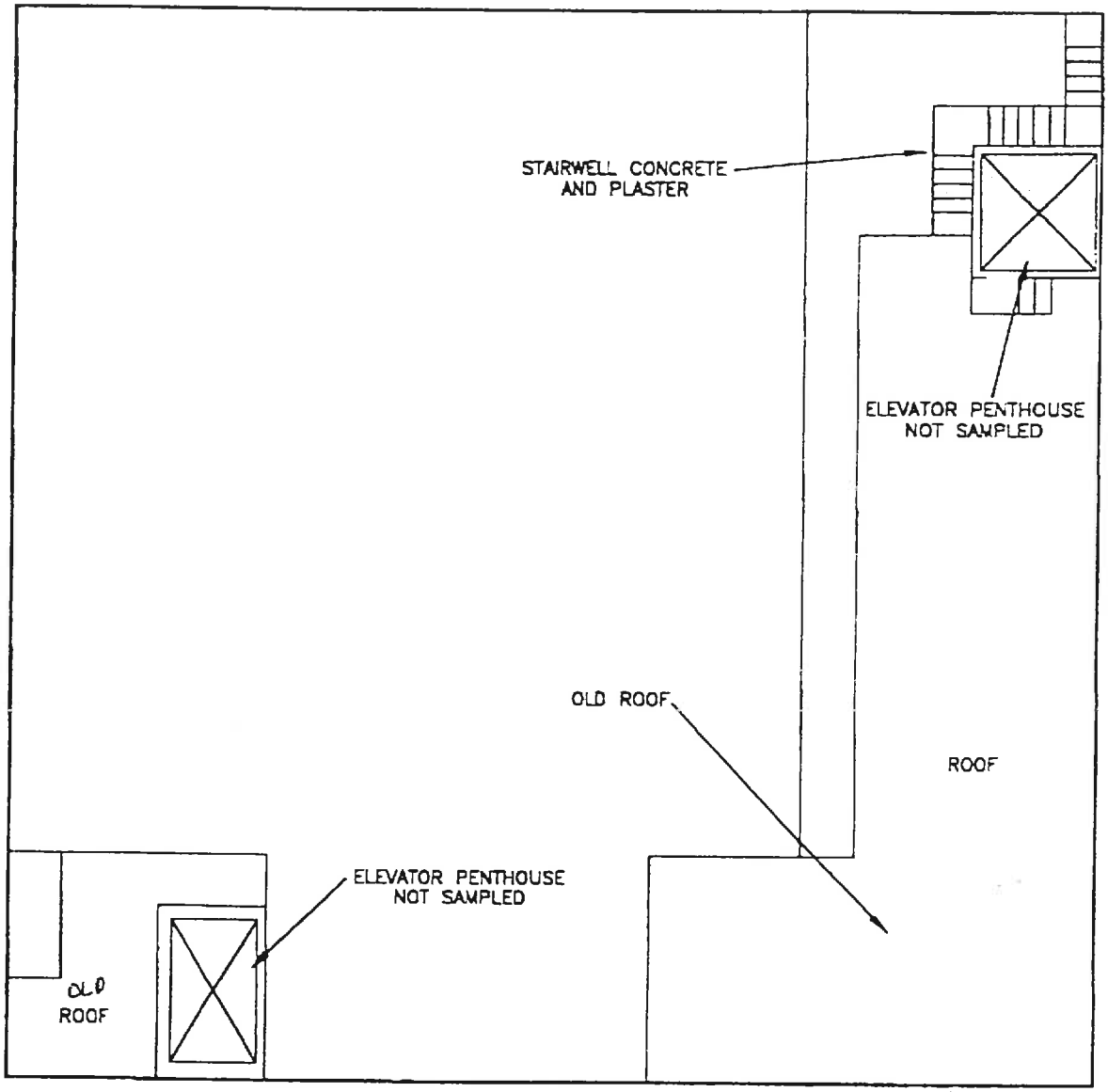
ROOF = BLUE FOAM ROOF WITH STONES ON TOP EXCEPT FOR 2'x2' CONCRETE WALKING BLOCKS. FABRIC MATERIAL ON TOP OF BLUE FOAM.

LUNCH ROOM, BATHS AND JANITORIAL CLOSET HAVE 2'x2' C.T.

N

Drawing not to scale

Hygienetics Environmental 210 Marina Village Parkway, Suite 104 Alameda, California 94501	THIRD FLOOR County Building No. 04640 393 13th Street Oakland, California	PROJECT NO. 4044.024 / DRAWN BY EC	PLATE 5
		REPORT DATE August 2001	



LEGEND

+031400-784-02A
+031400-784-02B
+031400-784-02C
+031400-784-03
= RECORDS OF EXACT SAMPLE LOCATIONS NOT AVAILABLE. UPPER OLD ROOF IS CONSIDERED POSITIVE FOR ASBESTOS.

N

Drawing not to scale

Hygienetics Environmental 1210 Marina Village Parkway, Suite 104 Alameda, California 94501	ROOF PLAN County Building No. 04640 393 13th Street Oakland, California	PROJECT NO. 4044.024 / DRAWN BY EC	PLATE 6
		REPORT DATE August 2001	

County of Alameda

Miscellaneous Asbestos Sampling Data

04640
ENT. 11/1/16
RE

ASBESTOS TEM LABORATORIES, INC.

EPA Interim Method
Polarized Light Microscopy
Analytical Report

Laboratory Job # 342331

600 Bancroft Way, Ste. A
Berkeley, CA 94710
(510) 704-8930
FAX (510) 704-8429
www.asbestostemlabs.com

With Branch Offices Located At:
1350 FREEPORT BLVD. UNIT 104, SPARKS, NV 89431
Ph. (775) 359-3377

ASBESTOS TEM LABORATORIES, INC

CA DPH ELAP
Lab No. 1866

NVLAP®
NVLAP Lab Code: 101891-0
Berkeley, CA

Jul-07-16

Steff Steiner
Terracon Consultants, Inc.
1466 66th Street
Emeryville, CA 94608

RE: LABORATORY JOB # 342331
Polarized light microscopy analytical results for 31 bulk sample(s) with 9 sample split(s)
Job Site: 393 13th St. Oakland
Job No.: R1167716

Enclosed please find the bulk material analytical results for one or more samples submitted for asbestos analysis. The analyses were performed in accordance with EPA Method 600/R-93/116 or 600/M4-82-020 for the determination of asbestos in bulk building materials by polarized light microscopy (PLM). Please note that while PLM analysis is commonly performed on non-friable and fine grained materials such as floor tiles and dust, the EPA method recognizes that PLM is subject to limitations. In these situations, accurate results may only be obtainable through the use of more sophisticated and accurate techniques such as transmission electron microscopy (TEM) or X-ray diffraction (XRD).

Prior to analysis, samples are logged-in and all data pertinent to the sample recorded. The samples are checked for damage or disruption of any chain-of-custody seals. A unique laboratory ID number is assigned to each sample. A hard copy log-in sheet containing all pertinent information concerning the sample is generated. This and all other relevant paper work are kept with the sample throughout the analytical procedures to assure proper analysis.

Each sample is opened in a class 100 HEPA negative air hood. A representative sampling of the material is selected and placed onto a glass microscope slide containing a drop of refractive index oil. The glass slide is placed under a polarizing light microscope where standard mineralogical techniques are used to analyze and quantify the various materials present, including asbestos. The data is then compiled into a standard report format and reviewed by the authorized signatory before being released to the client.

Sincerely Yours,

Lab Manager
ASBESTOS TEM LABORATORIES, INC.

--- These results relate only to the samples tested and must not be reproduced, except in full, with the approval of the laboratory. This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government. ---

Note: Test samples will be stored for three months after data of receipt, after which they will be properly disposed unless client makes other arrangements with the laboratory.

POLARIZED LIGHT MICROSCOPY
ANALYTICAL REPORT

EPA Method 600/R-93/116 or 600/M4-82-020

Contact: Steff Steiner

Address: Terracon Consultants, Inc.
1466 66th Street
Emeryville, CA 94608

Samples Indicated: 31
Reg. Samples Analyzed: 31
Split Layers Analyzed: 9

Job Site / No. 393 13th St. Oakland
R1167716

Report No. **342331**
Date Submitted: Jul-05-16
Date Reported: Jul-07-16

SAMPLE ID	ASBESTOS % TYPE	OTHER DATA 1) Non-Asbestos Fibers 2) Matrix Materials 3) Date/Time Collected 4) Date Analyzed	DESCRIPTION FIELD / LAB
27A Concrete Slab Lab ID # 1434-01332-001	**None Detected**	1) None Detected 2) 99-100% Calc, Qtz, Opq, Other m.p. 3) 4) Jul-07-16	1st Fl. W. Side Concrete-Grey
27B Concrete Slab Lab ID # 1434-01332-002	**None Detected**	1) None Detected 2) 99-100% Calc, Qtz, Opq, Other m.p. 3) 4) Jul-07-16	1st Fl. E Conf Rm Concrete-Grey
28A Int. Plaster Lab ID # 1434-01332-003	**None Detected**	1) 6-15% Fiberglass,Cellulose 2) 85-94% Calc, Gyp, Other m.p. 3) 4) Jul-07-16	Basmt. at lift Plaster-Off-White
28B Int. Plaster Lab ID # 1434-01332-004	**None Detected**	1) 6-15% Fiberglass,Cellulose 2) 85-94% Calc, Gyp, Other m.p. 3) 4) Jul-07-16	Basmt. at lift Plaster-Off-White
28C Int. Plaster Lab ID # 1434-01332-005	**None Detected**	1) 6-15% Fiberglass,Cellulose 2) 85-94% Calc, Gyp, Other m.p. 3) 4) Jul-07-16	Basmt. at lift Plaster-Off-White
29A Black Window Caulk Lab ID # 1434-01332-006	**None Detected**	1) None Detected 2) 99-100% Calc, Bndr 3) 4) Jul-07-16	Mezz window SW Side Caulk-Black
29B Black Window Caulk Lab ID # 1434-01332-007	**None Detected**	1) None Detected 2) 99-100% Calc, Bndr 3) 4) Jul-07-16	Mezz window E Side Caulk-Black
30A VFT, 12", white w/ black & grey pattern Lab ID # 1434-01332-008A	**None Detected**	1) 1-5% Cellulose 2) 95-99% Calc, Bndr, Glue, Plast 3) 4) Jul-07-16	Mezz at SE Utility Chese Vinyl Floor Tile-Off-White
30A VFT, 12", white w/ black & grey pattern Lab ID # 1434-01332-008B	**None Detected**	1) 5-10% Cellulose 2) 90-95% Tar, Bndr, Calc, Other m.p. 3) 4) Jul-07-16	Mezz at SE Utility Chese Mastic-Black
30B VFT, 12", white w/ black & grey pattern Lab ID # 1434-01332-009A	**None Detected**	1) 1-5% Cellulose 2) 95-99% Calc, Bndr, Glue, Plast 3) 4) Jul-07-16	Mezz at SE Utility Chese Vinyl Floor Tile-Off-White

Detection Limit of Method is Estimated to be 1% Asbestos Using a Visual Area Estimation Technique

Analyst Jo Ann Hunter

ASBESTOS TEM LABORATORIES, INC.
www.asbestostemlabs.com

600 Bancroft Way, Ste. A, Berkeley CA 94710 (510) 704-8930
With Offices in Reno, NV (775) 359-3377

POLARIZED LIGHT MICROSCOPY ANALYTICAL REPORT

EPA Method 600/R-93/116 or 600/M4-82-020

Contact: Steff Steiner

Address: Terracon Consultants, Inc.
1466 66th Street
Emeryville, CA 94608

Samples Indicated: 31
Reg. Samples Analyzed: 31
Split Layers Analyzed: 9

Job Site / No. 393 13th St. Oakland
R1167716

Report No. 342331
Date Submitted: Jul-05-16
Date Reported: Jul-07-16

SAMPLE ID	ASBESTOS % TYPE	OTHER DATA (1) Non-Asbestos Fibers (2) Matrix Materials (3) Date/Time Collected (4) Date Analyzed	DESCRIPTION FIELD / LAB
30B VFT, 12", white w/ black & grey pattern Lab ID # 1434-01332-009B	None Detected	1) 5-10% Cellulose 2) 90-95% Tar, Bndr, Calc, Other m.p. 3) 4) Jul-07-16	Mastic-Black
30C VFT, 12", white w/ black & grey pattern Lab ID # 1434-01332-010A	None Detected	1) 1-5% Cellulose 2) 95-99% Calc, Bndr, Glue, Plast 3) 4) Jul-07-16	2nd Fl at SE Data Room Vinyl Floor Tile-Off-White
30C VFT, 12", white w/ black & grey pattern Lab ID # 1434-01332-010B	None Detected	1) 5-10% Cellulose 2) 90-95% Tar, Bndr, Calc, Other m.p. 3) 4) Jul-07-16	Mastic-Black
31A Yellow Carpet Glue Lab ID # 1434-01332-011	None Detected	1) None Detected 2) 99-100% Calc, Bndr 3) 4) Jul-07-16	Mezz at NE side Mastic-Yellow
31B Yellow Carpet Glue Lab ID # 1434-01332-012	None Detected	1) None Detected 2) 99-100% Calc, Bndr 3) 4) Jul-07-16	Mezz at S walkway Mastic-Yellow
32A VFT 12", White w/ Tan "Fritz" Pattern Lab ID # 1434-01332-013A	None Detected	1) None Detected 2) 99-100% Calc, Bndr 3) 4) Jul-07-16	Mezz at NE water closet Floor Tile-Beige
32A VFT 12", White w/ Tan "Fritz" Pattern Lab ID # 1434-01332-013B	None Detected	1) None Detected 2) 99-100% Calc, Bndr 3) 4) Jul-07-16	Mezz at NE water closet Mastic-Yellow
32B VFT 12", White w/ Tan "Fritz" Pattern Lab ID # 1434-01332-014A	None Detected	1) None Detected 2) 99-100% Calc, Bndr 3) 4) Jul-07-16	Mezz at SE utility closet Floor Tile-Beige
32B VFT 12", White w/ Tan "Fritz" Pattern Lab ID # 1434-01332-014B	None Detected	1) None Detected 2) 99-100% Calc, Bndr 3) 4) Jul-07-16	Mastic-Yellow
32C VFT 12", White w/ Tan "Fritz" Pattern Lab ID # 1434-01332-015A	None Detected	1) None Detected 2) 99-100% Calc, Bndr 3) 4) Jul-07-16	2nd Fl. SW Mech. Rm. Floor Tile-Beige

Detection Limit of Method is Estimated to be 1% Asbestos Using a Visual Area Estimation Technique

Analyst Jo Ann Hunter

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www.asbestostemlabs.com

600 Bancroft Way, Ste. A, Berkeley CA 94710 (510) 704-8930
With Offices in Reno, NV (775) 359-3377

POLARIZED LIGHT MICROSCOPY
ANALYTICAL REPORT

EPA Method 600/R-93/116 or 600/M4-82-020

Contact: Steff Steiner

Address: Terracon Consultants, Inc.
1466 66th Street
Emeryville, CA 94608

Samples Indicated: 31
Reg. Samples Analyzed: 31
Split Layers Analyzed: 9

Job Site / No. 393 13th St. Oakland
R1167716

Report No. **342331**
Date Submitted: Jul-05-16
Date Reported: Jul-07-16

SAMPLE ID	ASBESTOS % TYPE	OTHER DATA 1) Non-Asbestos Fibers 2) Matrix Materials 3) Date/Time Collected 4) Date Analyzed	DESCRIPTION FIELD / LAB
32C VFT 12", White w/ Tan "Fritz" Pattern Lab ID # 1434-01332-015B	**None Detected**	1) None Detected 2) 99-100% Calc, Bndr 3) 4) Jul-07-16	Mastic-Yellow
33A Concrete Slab Lab ID # 1434-01332-016	**None Detected**	1) None Detected 2) 99-100% Calc, Qtz, Opq, Other m.p. 3) 4) Jul-07-16	Mezz at SE utility chase / Concrete-Grey
33B Concrete Slab Lab ID # 1434-01332-017	**None Detected**	1) None Detected 2) 99-100% Calc, Qtz, Opq, Other m.p. 3) 4) Jul-07-16	Mezz at S side office / Concrete-Grey
34A White glue Assoc w/ 4" Black Cove Lab ID # 1434-01332-018A	**None Detected**	1) None Detected 2) 99-100% Calc, Bndr 3) 4) Jul-07-16	Mezz at S side walkway / Mastic-Off-White
34A White glue Assoc w/ 4" Black Cove Lab ID # 1434-01332-018B	**None Detected**	1) None Detected 2) 99-100% Calc, Bndr 3) 4) Jul-07-16	Mezz at S side walkway / Baseboard-Black
34B White glue Assoc w/ 4" Black Cove Lab ID # 1434-01332-019	**None Detected**	1) None Detected 2) 99-100% Calc, Bndr 3) 4) Jul-07-16	2nd Fl. at E Side / Mastic-Off-White
35A Yellow Carpet Glue Lab ID # 1434-01332-020	**None Detected**	1) None Detected 2) 99-100% Calc, Bndr 3) 4) Jul-07-16	2nd Fl. NW Side / Mastic-Yellow
35B Yellow Carpet Glue Lab ID # 1434-01332-021	**None Detected**	1) None Detected 2) 99-100% Calc, Bndr 3) 4) Jul-07-16	2nd Fl. SE Side / Mastic-Yellow
36A Concrete Slab Lab ID # 1434-01332-022	**None Detected**	1) None Detected 2) 99-100% Calc, Qtz, Opq, Other m.p. 3) 4) Jul-07-16	2nd Fl. NE Side / Concrete-Grey
36B Concrete Slab Lab ID # 1434-01332-023	**None Detected**	1) None Detected 2) 99-100% Calc, Qtz, Opq, Other m.p. 3) 4) Jul-07-16	2nd Fl. SW Side / Concrete-Grey

Detection Limit of Method is Estimated to be 1% Asbestos Using a Visual Area Estimation Technique

Analyst Jo Ann Hunter

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With Offices in Reno, NV (775) 359-3377

POLARIZED LIGHT MICROSCOPY
ANALYTICAL REPORT

EPA Method 600/R-93/116 or 600/M4-82-020

Contact: Steff Steiner

Address: Terracon Consultants, Inc.
1466 66th Street
Emeryville, CA 94608

Samples Indicated: 31
Reg. Samples Analyzed: 31
Split Layers Analyzed: 9

Job Site / No. 393 13th St. Oakland
R1167716

Report No. **342331**
Date Submitted: Jul-05-16
Date Reported: Jul-07-16

SAMPLE ID	ASBESTOS % TYPE	OTHER DATA (1) Non-Asbestos Fibers (2) Matrix Materials (3) Date/Time Collected (4) Date Analyzed	DESCRIPTION FIELD / LAB
37A Light Gray HVAC Seam Sealant Lab ID # 1434-01332-024	**None Detected**	1) 1-5% Cellulose 2) 95-99% Opq, Tar, Qtz 3) 4) Jul-07-16	3rd Fl. Patio HVAC Duct Sealant-Grey
37B Light Gray HVAC Seam Sealant Lab ID # 1434-01332-025	**None Detected**	1) 1-5% Cellulose 2) 95-99% Opq, Tar, Qtz 3) 4) Jul-07-16	3rd Fl. Patio HVAC Duct Sealant-Grey
38A Dark Gray HVAC Lab ID # 1434-01332-026	**None Detected**	1) 1-5% Cellulose 2) 95-99% Opq, Tar, Qtz 3) 4) Jul-07-16	3rd Fl. Patio HVAC Duct Sealant-Dk. Grey
38B Dark Gray HVAC Lab ID # 1434-01332-027	**None Detected**	1) 1-5% Cellulose 2) 95-99% Opq, Tar, Qtz 3) 4) Jul-07-16	3rd Fl. Patio HVAC Duct Sealant-Dk. Grey
39A While Sealant on HVAC support feet Lab ID # 1434-01332-028	**None Detected**	1) 1-5% Cellulose 2) 95-99% Opq, Tar, Qtz 3) 4) Jul-07-16	3rd Fl. Patio HVAC unit supports Sealant-White
39B While Sealant on HVAC support feet Lab ID # 1434-01332-029	**None Detected**	1) 1-5% Cellulose 2) 95-99% Opq, Tar, Qtz 3) 4) Jul-07-16	3rd Fl. Patio HVAC unit supports Sealant-White
40A Brown Mastic Assoc w/FG Insulation Lab ID # 1434-01332-030A	**None Detected**	1) None Detected 2) 99-100% Calc, Bndr 3) 4) Jul-07-16	2nd Fl. Ceiling at Center Mastic-Brown
40A Brown Mastic Assoc w/FG Insulation Lab ID # 1434-01332-030B	**None Detected**	1) 90-95% Fiberglass 2) 5-10% GlassFrags, Opq 3) 4) Jul-07-16	2nd Fl. Ceiling at Center Insulation-Yellow
40B Brown Mastic Assoc w/FG Insulation Lab ID # 1434-01332-031A	**None Detected**	1) None Detected 2) 99-100% Calc, Bndr 3) 4) Jul-07-16	2nd Fl. Ceiling at Center Mastic-Brown
40B Brown Mastic Assoc w/FG Insulation Lab ID # 1434-01332-031B	**None Detected**	1) 90-95% Fiberglass 2) 5-10% GlassFrags, Opq 3) 4) Jul-07-16	 Insulation-Yellow

Detection Limit of Method is Estimated to be 1% Asbestos Using a Visual Area Estimation Technique

Analyst Jo Ann Hunter

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342331

Terracon

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☐ PM – M. Bryant mvbryant@terracon.com	☐ PM – T. Kattchee takattchee@terracon.com	☐ PM – W. Frieszell wmfrieszell@terracon.com
☐ PM- M. Benefield mebenefield@terracon.com	☐ PM D. Ufferfilge dufferfilge@terracon.com	☐ PM – M. Bishop mrbishop@terracon.com

ACM BULK SAMPLE DATA SHEET

☒ PLM Analysis (Analyze all samples)
☐ Stop Analysis at First Positive
☐ Point Count Analysis (400-point)

Project Name/ Address/ Building No. 393 13th St. Oakland

Project# E1167K **Sampled By:** Mike B **Sampling Date:** 7/5/16

Sample(s) sent to: ☐ MAL ☐ AERO ☐ EMLAB ☐ Other

TAT ☐ Rush ☐ 24HRS ☒ 48HR ☐ 3-5 days

HM# 27	Material Description: Caulk Slab	
Sample ID	Sample Location & Material Location	Quantity:
27A	1st Fl W Side	
27B	" " E Conf Rm	

HM# 26	Material Description: Int. Plaster	
Sample ID	Sample Location & Material Location	Quantity:
26A	Base at LL	
26B	" "	
26C	" "	

HM# 29	Material Description: Black Window Caulk	
Sample ID	Sample Location & Material Location	Quantity:
29A	Base at Window SW Side	
29B	" " E Side	

HM# 30	Material Description: VFT, 12", Wht w/ Blue & Gry Pattern	
Sample ID	Sample Location & Material Location	Quantity: 1 Blue
30A	Base at SE Utility Closet	Glue
30B	"	
30C	2nd Fl at SE Data Room	

HM# 31	Material Description: Yellow Carpet Glue	
Sample ID	Sample Location & Material Location	Quantity:
31A	Base at NE Side	
31B	" " at S Walkway	

Relinquished By:	Mike B	**Signature:**		**Date/Time:** 7/6/16
Received By:	Bart Arlon	**Signature:**		**Date/ Time:** 7/5 @ 12:40p
Relinquished By:		**Signature:**		**Date/Time:**
Received By:		**Signature:**		**Date/Time:**

342331

Terracon

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☐ PM – M. Bryant mvbryant@terracon.com	☐ PM – T. Kattchee takattchee@terracon.com	☐ PM – W. Frieszell wmfrieszell@terracon.com
☐ PM- M. Benefield msbenefield@terracon.com	☐ PM D. Ufferfilge dufferfilge@terracon.com	☐ PM – M. Bishop mrbishop@terracon.com

ACM BULK SAMPLE DATA SHEET

☒ PLM Analysis (Analyze all samples)
☐ Stop Analysis at First Positive
☐ Point Count Analysis (400-point)

PAGE 3 OF 3

Project Name/ Address/ Building No. 393 Bth St.

Project# RALTK Sampled By: MB Sampling Date: 7/5/16

Sample(s) sent to: ☐ MAL ☐ AERO ☐ EMLAB ☐ Other

TAT ☐ Rush ☐ 24HRS ☐ 48HR ☐ 3-5 days

HM# 32	Material Description: VT, 12" White w Tan "Fritz" Pattern
Sample ID	Sample Location & Material Location — Quantity:
32A	Mezz at NE Water Closet
32B	" " at SE Utility Closet
32C	2nd Fl SW Mech Rm

HM# 33	Material Description: Cement Skim
Sample ID	Sample Location & Material Location — Quantity:
33A	Mezz at SE utility Closet
33B	Mezz at S Side Office

HM# 34	Material Description: Yellow Carpet Mastic Glue Associated
Sample ID	Sample Location & Material Location — Quantity: 4" Black
34A	Mezz at S Side Walking Core
34B	2nd Fl. at E Side

HM# 35	Material Description: Yellow Carpet Glue
Sample ID	Sample Location & Material Location — Quantity:
35A	2nd Fl. NW Side
35B	" " SE Side

HM# 36	Material Description: Concrete Slab
Sample ID	Sample Location & Material Location — Quantity:
36A	2nd Fl NE Side
36B	" " SW Side

Relinquished By:	M.L.B	Signature:		Date/Time:	7/5/16
Received By:		Signature:		Date/ Time:	
Relinquished By:		Signature:		Date/Time:	
Received By:		Signature:		Date/Time:	

342331

Terracon

☒ PM – S. Steiner sjsteiner@terracon.com	☐ PM – K. Schroeter kmschroeter@terracon.com	☐ PM – K. Pilgrim kpilgrim@terracon.com
☐ PM – M. Bryant mybryant@terracon.com	☐ PM – T. Kattchee tekattchee@terracon.com	☐ PM – W. Frieszell wmfrieszell@terracon.com
☐ PM- M. Benefield msbenefield@terracon.com	☐ PM D. Ufferfilge dufferfilge@terracon.com	☐ PM – M. Bishop mrbishop@terracon.com

ACM BULK SAMPLE DATA SHEET

☒ PLM Analysis (Analyze all samples)
☐ Stop Analysis at First Positive
☐ Point Count Analysis (400-point)

PAGE 3 OF

Project Name/ Address/ Building No. 393 Bush St.

Project# 21CTK Sampled By: MB Sampling Date: 7/5/16

Sample(s) sent to: ☐ MAL ☐ AERO ☐ EMLAB ☐ Other

TAT ☐ Rush ☐ 24HRS ☐ 48HR ☐ 3-5 days

HM# 37	Material Description: Light Gray HVAC duct sealant
Sample ID	Sample Location & Material Location — Quantity:
37A	3rd Fl Public HVAC Duct
37B	"

HM# 38	Material Description: Dark Gray HVAC sealant
Sample ID	Sample Location & Material Location — Quantity:
38A	3rd Fl Public at Base of HVAC Duct
38B	"

HM# 39	Material Description: White Sealant on HVAC support feet
Sample ID	Sample Location & Material Location — Quantity:
39A	3rd Fl Public HVAC unit Support
39B	"

HM# 40	Material Description: Brown Mastic Adhesive on FG Insulation
Sample ID	Sample Location & Material Location — Quantity:
40A	3rd Fl Ceiling & Cavity
40B	"

HM#	Material Description:
Sample ID	Sample Location & Material Location — Quantity:

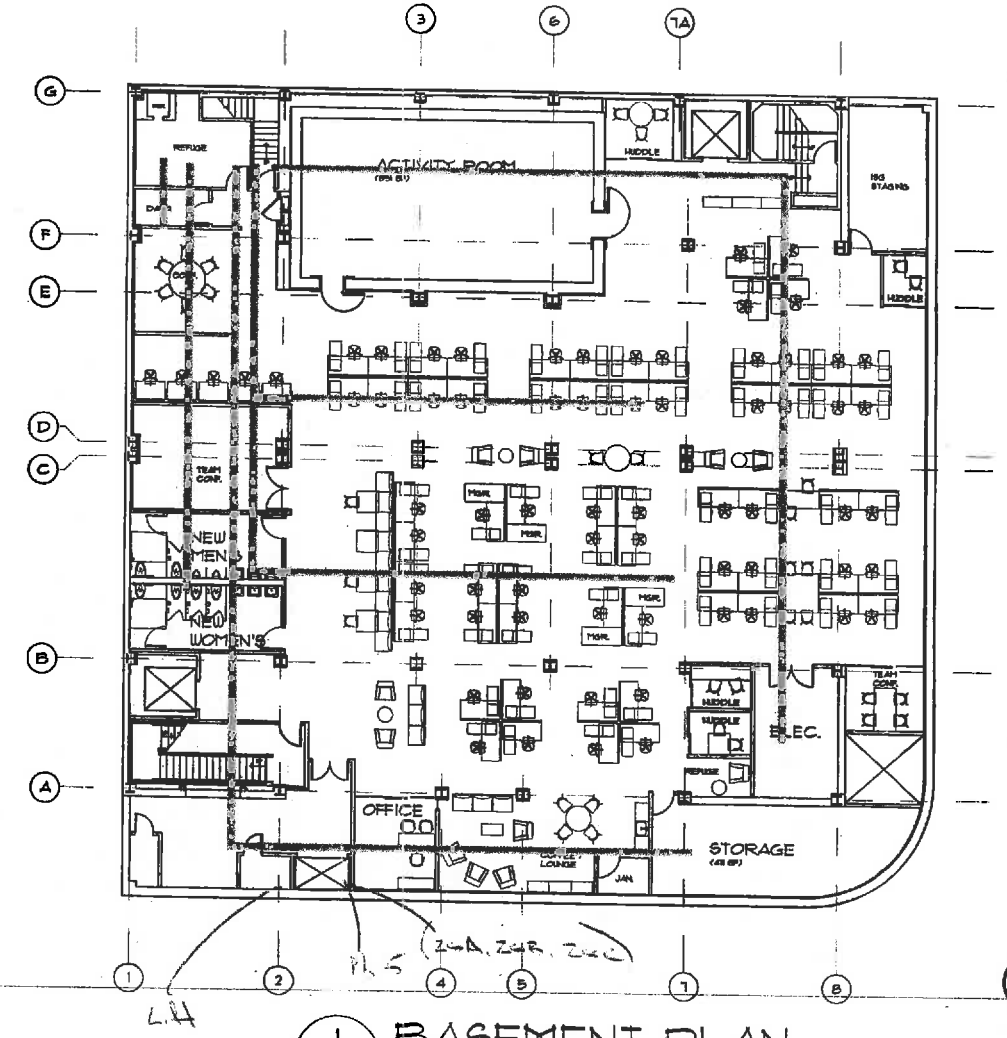
Relinquished By:	M. Kibbi	Signature:		Date/Time:	7/5/16
Received By:		Signature:		Date/ Time:	
Relinquished By:		Signature:		Date/Time:	
Received By:		Signature:		Date/Time:	

Appendix A

Mechanical Ductwork Sketch

Total Length x 1.2 Safety Factor ~
2700 lineal feet

Shown are Supply Ducts



(60) WORK BENCHES
(4) MANAGER'S SEATING
(1) OFFICE
(5) CONTRACTOR'S STATIONS
(3) SMALL CONFERENCE
(4) HUDDLE ROOMS
156 STAGING ROOM
ACTIVITY ROOM
REFUGE
COFFEE / LOUNGE
STORAGE

1/A1 BASEMENT PLAN
SCALE: 1/16" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
427 THIRTEENTH STREET
OAKLAND, CA 94612
PH: 510.444.1677 FX: 510.444.2242
kta@ktarch.com www.ktarch.com

BASEMENT

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

GENERAL SERVICES AGENCY
COUNTY OF ALAMEDA

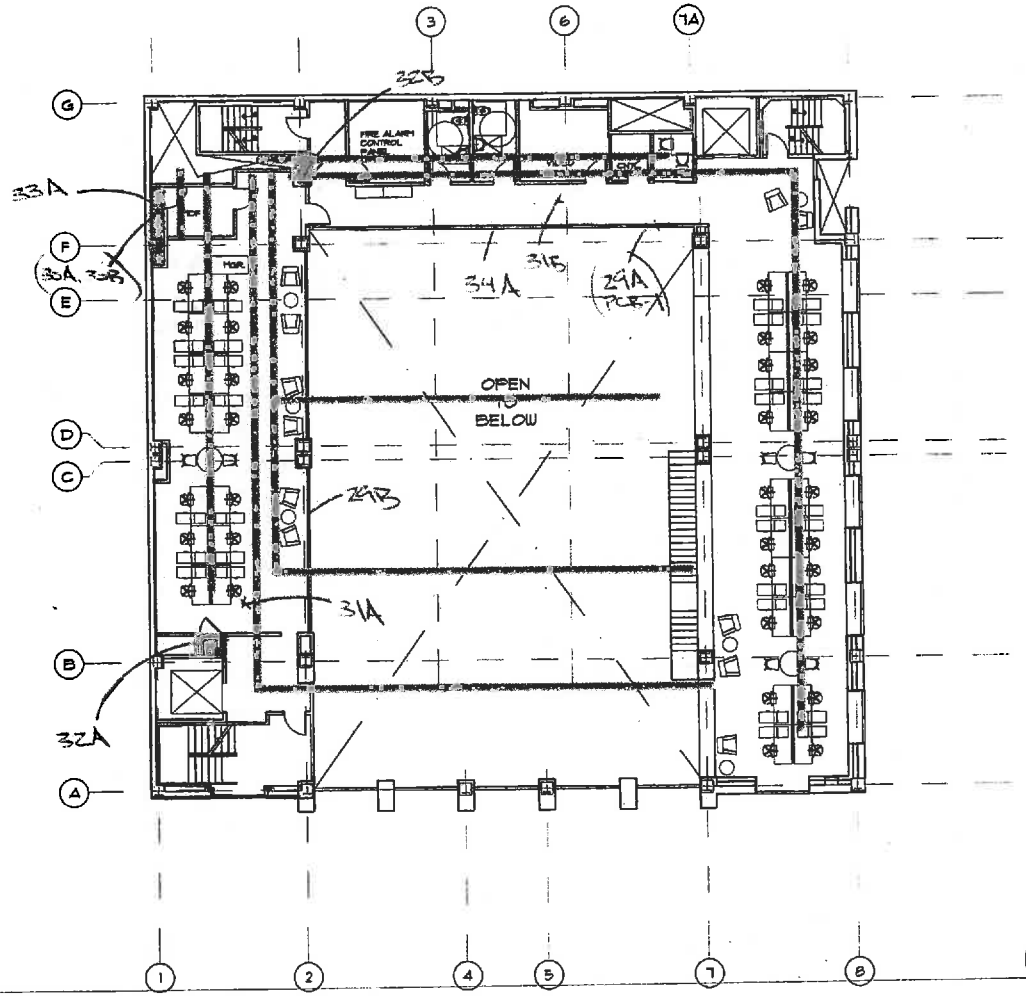
DATE: 02/24/2016
DRAWN BY: wy
JOB NO.: 1203.22

A1

Appendix A

Mechanical Ductwork Sketch

- HM-30
- HM-32



(33) WORK BENCHES
(1) MANAGER'S SEATING
(2) HUDDLE SPACES
(0) CONTRACTOR'S STATIONS
(1) VIDEO / OFFICE
(2) RESTROOMS
MDF ROOM

1/A3 MEZZANINE FLOOR PLAN
SCALE: 1/16" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
427 THIRTEENTH STREET
OAKLAND, CA 94612
Ph: 510.446.2244 Fx: 510.446.2242
kta@ktarch.com www.ktarch.com

MEZZANINE

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

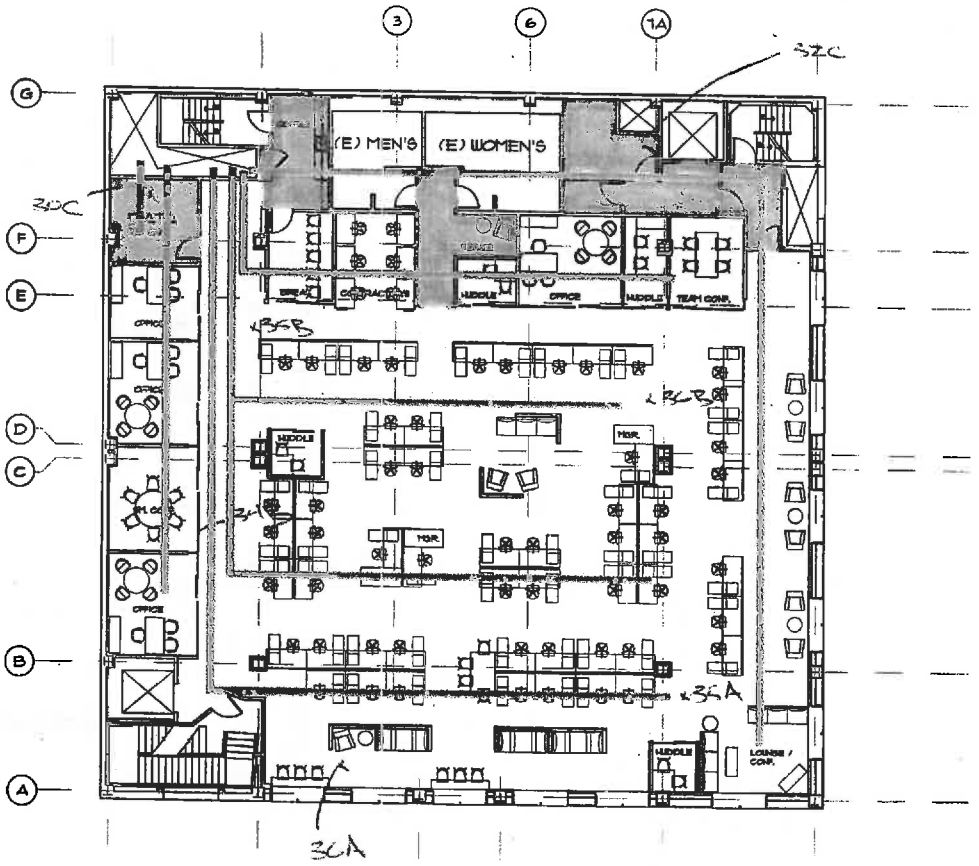
GENERAL SERVICES AGENCY COUNTY OF ALAMEDA GSA

DATE: 02/24/2016
DRAWN BY: wy
JOB NO.: 1203.22

A3

Appendix A

Mechanical Ductwork Sketch



(51) WORK BENCHES
(3) MANAGER'S SEATING
(4) HUDDLE SPACES
(6) CONTRACTOR'S STATIONS
(4) OFFICES
(3) SMALL CONFERENCE
(1) BREAK
(1) COFFEE
(1) LOUNGE / CONFERENCE
(1) RETREAT

1 / A4 SECOND FLOOR PLAN
SCALE: 1/16" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
427 THIRTEENTH STREET
OAKLAND, CA 94612
Ph: 510.446.2244 Fx: 510.446.2242
kta@ktarch.com www.ktarch.com

SECOND FLOOR

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

GENERAL SERVICES AGENCY COUNTY OF ALAMEDA

DATE: 02/24/2015
DRAWN BY: wy
JOB NO.: 1203.22

A4

Appendix A

Mechanical Roof Layout with Acoustical Data

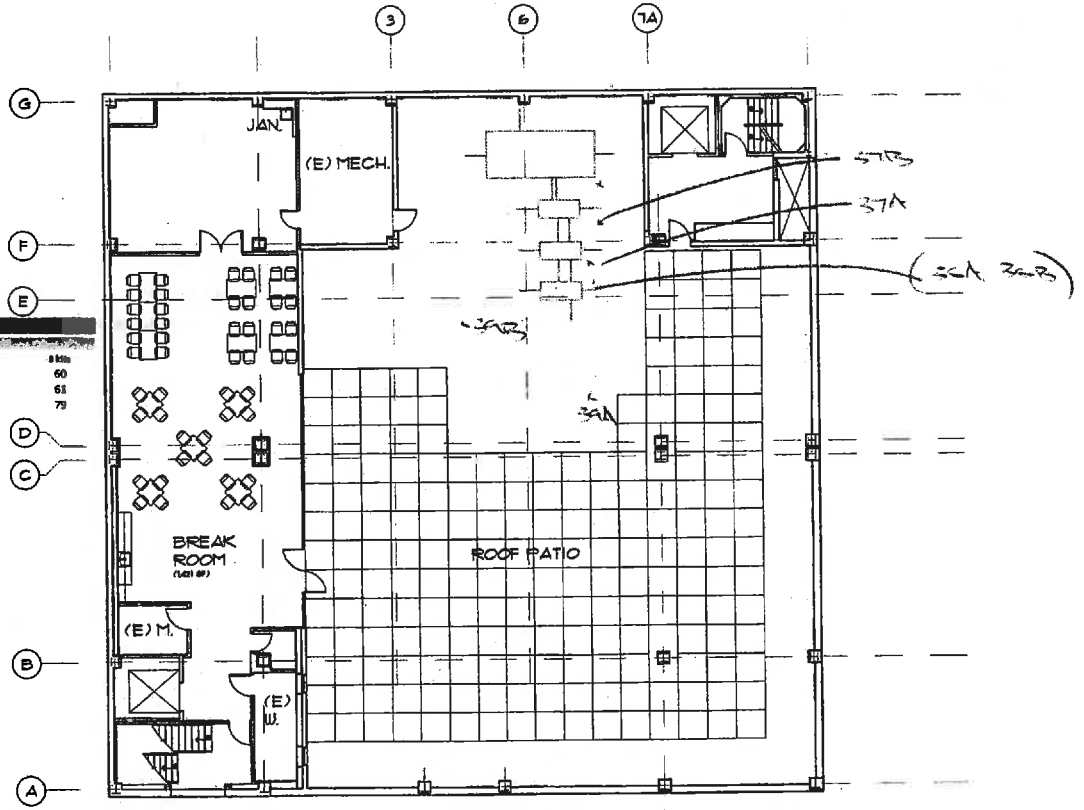
DOAS w/VRF

Daikin Rebel DOAS 77"x183"
1 unit of 10000 cfm, 26 ton

Frequency	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Inlet	90	89	87	82	81	75	67	60
Discharge	90	86	87	82	81	76	68	61
Radiated	-	91	88	86	86	82	80	79

Mitsbushi Heat Pump 69"x30"
3 units of 22 tons each

Sound Pressure Level (Measured in Anechoic Room)	dB(A)	63.5



BREAK ROOM
ROOF PATIO
SHOWER

1/A5 THIRD FLOOR PLAN
SCALE: 1/8" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
437 THIRTEENTH STREET
OAKLAND, CA 94612
Ph: 510.446.2244 Fx: 510.446.2242
kta@ktarch.com www.ktarch.com

THIRD FLOOR

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

GENERAL SERVICES AGENCY COUNTY OF ALAMEDA GSA

DATE: 02/24/2015
DRAWN BY: wy
JOB NO.: 1203.22

A5

04640

ASBESTOS TEM LABORATORIES, INC.

EPA Interim Method
Polarized Light Microscopy
Analytical Report

Laboratory Job # 340896

600 Bancroft Way, Ste. A
Berkeley, CA 94710
(510) 704-8930
FAX (510) 704-8429
www.asbestostemlabs.com

With Branch Offices Located At:
1350 FREEPORT BLVD. UNIT 104, SPARKS, NV 89431
Ph. (775) 359-3377

ASBESTOS TEM LABORATORIES, INC

CA DPH ELAP
Lab No. 1866

NVLAP
NVLAP Lab Code: 101891-0
Berkeley, CA

May-06-16

Steffan Steinèr
Terracon Consultants, Inc.
1466 66th Street
Emeryville, CA 94608

RE: LABORATORY JOB # 340896
Polarized light microscopy analytical results for 3 bulk sample(s) with 3 sample split(s)
Job Site: 393 13th Street
Job No.: R1167631

Enclosed please find the bulk material analytical results for one or more samples submitted for asbestos analysis. The analyses were performed in accordance with EPA Method 600/R-93/116 or 600/M4-82-020 for the determination of asbestos in bulk building materials by polarized light microscopy (PLM). Please note that while PLM analysis is commonly performed on non-friable and fine grained materials such as floor tiles and dust, the EPA method recognizes that PLM is subject to limitations. In these situations, accurate results may only be obtainable through the use of more sophisticated and accurate techniques such as transmission electron microscopy (TEM) or X-ray diffraction (XRD).

Prior to analysis, samples are logged-in and all data pertinent to the sample recorded. The samples are checked for damage or disruption of any chain-of-custody seals. A unique laboratory ID number is assigned to each sample. A hard copy log-in sheet containing all pertinent information concerning the sample is generated. This and all other relevant paper work are kept with the sample throughout the analytical procedures to assure proper analysis.

Each sample is opened in a class 100 HEPA negative air hood. A representative sampling of the material is selected and placed onto a glass microscope slide containing a drop of refractive index oil. The glass slide is placed under a polarizing light microscope where standard mineralogical techniques are used to analyze and quantify the various materials present, including asbestos. The data is then compiled into a standard report format and reviewed by the authorized signatory before being released to the client.

Sincerely Yours,

Lab Manager
ASBESTOS TEM LABORATORIES, INC.

--- These results relate only to the samples tested and must not be reproduced, except in full, with the approval of the laboratory. This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government. ---

Note: Test samples will be stored for three months after data of receipt, after which they will be properly disposed unless client makes other arrangements with the laboratory.

POLARIZED LIGHT MICROSCOPY
ANALYTICAL REPORT

EPA Method 600/R-93/116 or 600/M4-82-020

Contact: Steffan Steiner

Address: Terracon Consultants, Inc.
1466 66th Street
Emeryville, CA 94608

Samples Indicated: 4
Reg. Samples Analyzed: 3
Split Layers Analyzed: 3

Job Site / No. 393 13th Street
R1167631

Report No. **340896**
Date Submitted: May-06-16
Date Reported: May-06-16

SAMPLE ID	ASBESTOS %	ASBESTOS TYPE	OTHER DATA 1) Non-Asbestos Fibers 2) Matrix Materials 3) Date/Time Collected 4) Date Analyzed	DESCRIPTION FIELD LAB
01A		None Detected	1) 6-15% Fiberglass,Cellulose 2) 85-94% Calc, Gyp, Other m.p.	Plaster behind drywall, Mezzanine corridor at center
Lab ID # 1434-01128-001A			3) 4) May-06-16	Plaster-White
01A		None Detected	1) 1-5% Cellulose 2) 95-99% Gyp, Opq, Other m.p.	Plaster behind drywall, Mezzanine corridor at center
Lab ID # 1434-01128-001B			3) 4) May-06-16	Drywall-White
01B		None Detected	1) 6-15% Fiberglass,Cellulose 2) 85-94% Calc, Gyp, Other m.p.	Plaster behind drywall, Mezzanine corridor at W side
Lab ID # 1434-01128-002A			3) 4) May-06-16	Plaster-White
01B		None Detected	1) 1-5% Cellulose 2) 95-99% Gyp, Opq, Other m.p.	
Lab ID # 1434-01128-002B			3) 4) May-06-16	Drywall-White
01C		None Detected	1) 6-15% Fiberglass,Cellulose 2) 85-94% Calc, Gyp, Other m.p.	Plaster behind drywall, 2nd floor at SE side by break area
Lab ID # 1434-01128-003A			3) 4) May-06-16	Plaster-White
01C		None Detected	1) 1-5% Cellulose 2) 95-99% Gyp, Opq, Other m.p.	
Lab ID # 1434-01128-003B			3) 4) May-06-16	Drywall-White
			1) 2)	
Lab ID #			3) 4)	
			1) 2)	
Lab ID #			3) 4)	
			1) 2)	
Lab ID #			3) 4)	
			1) 2)	
Lab ID #			3) 4)	

Detection Limit of Method is Estimated to be 1% Asbestos Using a Visual Area Estimation Technique

Analyst Jo Ann Hnatko

ASBESTOS TEM LABORATORIES, INC.
www.asbestostemlabs.com

600 Bancroft Way, Ste. A, Berkeley CA 94710 (510) 704-8930
With Offices in Reno, NV (775) 359-3377

Terracon

1466 66th Street Emeryville CA 94608 Tel: (510) 547-7771 Fax: (510) 547-1983

X PM – S. Steiner sjsteiner@terracon.com
__PM – K. Schroeter kmschroeter@terracon.com
__PM – K. Pilgrim kmpilgrim@terracon.com
__PM – M. Bryant mvbryant@terracon.com
__PM – T. Kattchee takattchee@terracon.com
__PM – B. Gils regils@terracon.com
__PM- M. Benefield msbenefield@terracon.com
__PM D. Ufferfilge dufferfilge@terracon.com

ACM BULK SAMPLE DATA SHEET

X PLM Analysis (Analyze all samples)
___ Stop Analysis at First Positive
___ Point Count Analysis (400-point)

PAGE 1 OF __

Project Name/Address/Building No.: 393 13th St

Project #: R1L7C31 Sampled By: M.L. B Sampling Date: 5/4/16

Sample(s) Sent To: _____ other: _____ TAT: X Rush __ 24Hrs __ 48Hrs __ 3-5 Days

***E-MAIL REPORT TO: *SEE ABOVE PROJECT MANAGER (PM)* ***

HM#	Material Description: Plaster Behind Drywall	Qty
Sample ID	Sample Location	Material Locations
- -01A	Accessway Corridor at Center	
- -01B	" " at W Side	
- -01C	2nd Fl at SE Side by Break area	

HM#	Material Description	Qty
Sample ID	Sample Location	Material Locations
- -		
- -		
- -		

HM#	Material Description	Qty
Sample ID	Sample Location	Material Locations
- -		
- -		
- -		

HM#	Material Description	Qty
Sample ID	Sample Location	Material Locations
- -		
- -		
- -		

HM#	Material Description	Qty
Sample ID	Sample Location	Material Locations
- -		
- -		
- -		
- -		

Relinquished By: _____ Signature: _____ Date/Time: 5/6/16
Received By: _____ Signature: _____ Date/Time: 5/6/16 2:35
Relinquished By: _____ Signature: _____ Date/Time: _____
Received By: _____ Signature: _____ Date/Time: _____

RIK7631 - SK/KC

PRIMARY (WORKBENCHES, MANAGERS, CONTRACTORS)

OFFICES

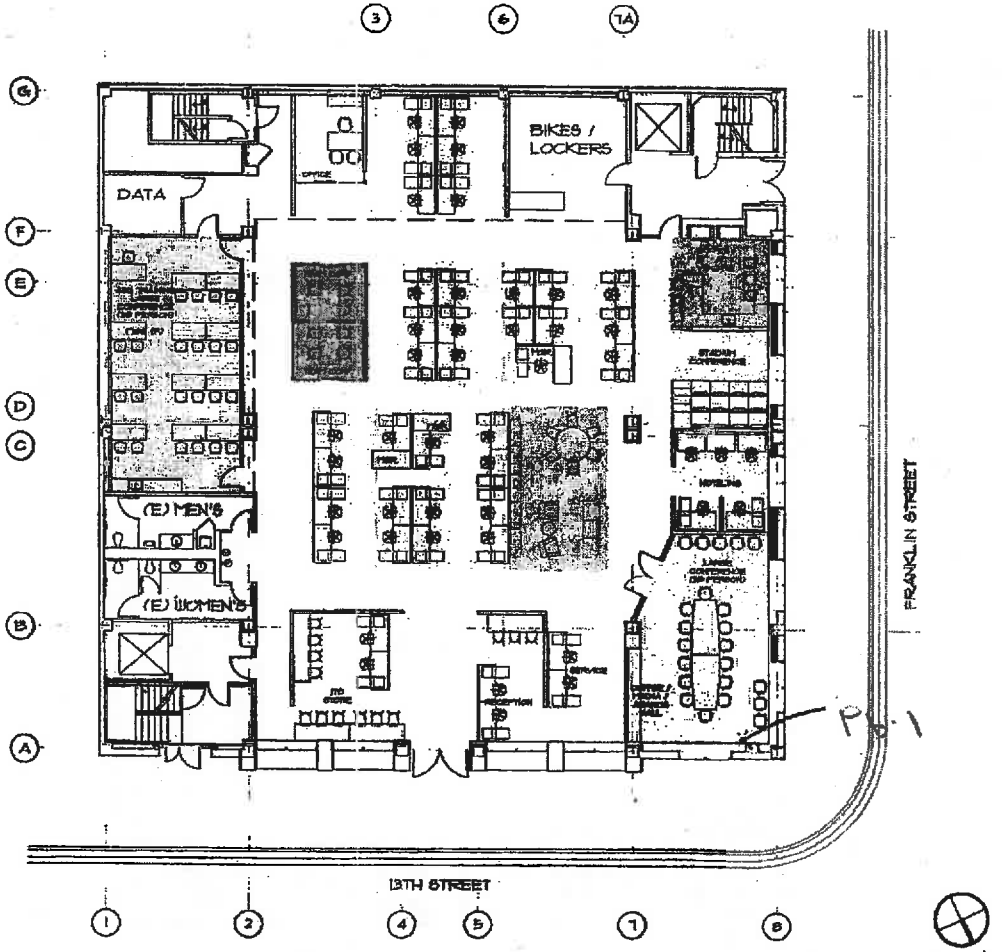
COMMUNITY + COLLABORATION

TEAM MEETING

CONFERENCE / ASSEMBLY

REFUGE

(31) WORK BENCHES
(3) MANAGER'S SEATING
(1) OFFICE
(3) CONTRACTOR'S STATIONS
(2) HOTELING
(2) RECEPTION
(2) "HOST"
(2) SERVICE
(2) SMALL CONFERENCE
ITD STORE
ASG TRAINING / LG. CONF.
LARGE CONFERENCE
STADIUM CONFERENCE
COFFEE / BREAK AREA
BIKES AND LOCKERS



1/A2 FIRST FLOOR PLAN
SCALE: 1/16" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
437 THIRTEENTH STREET
OAKLAND, CA 94612
PH: 510.444.2344 FX: 510.444.2349
info@komorous.com

FIRST FLOOR

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

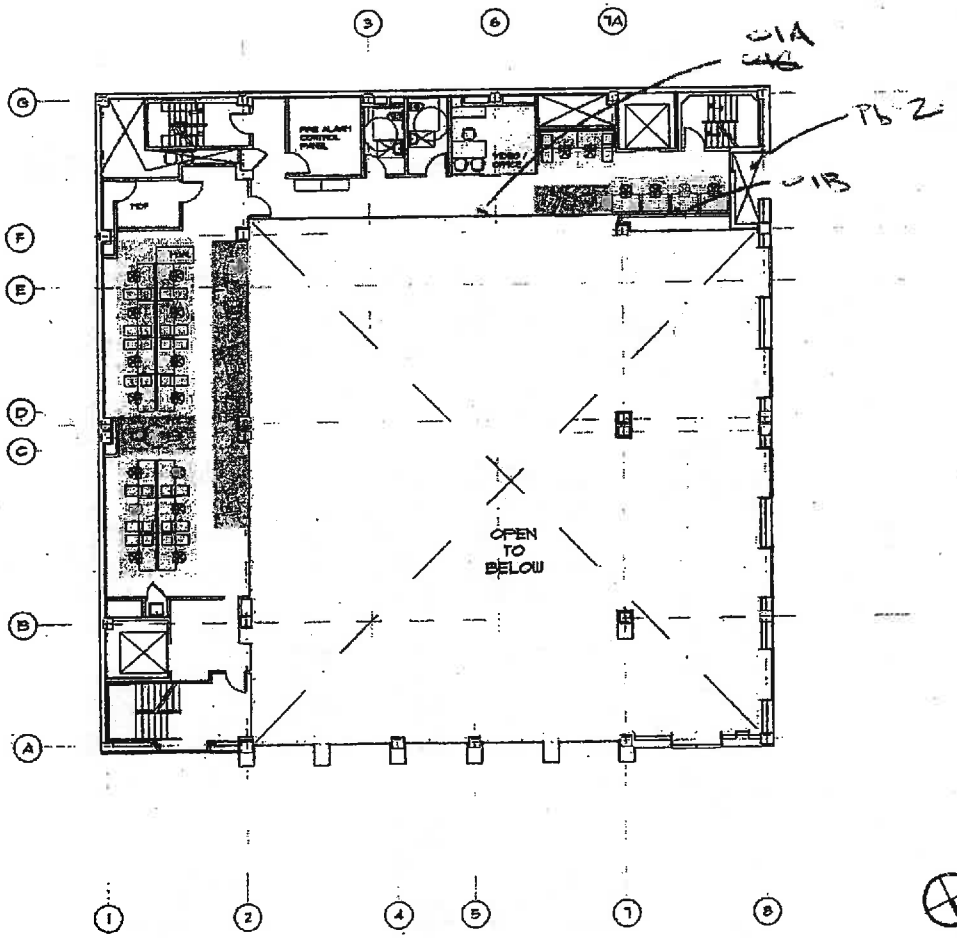
GENERAL SERVICES AGENCY
GSA
COUNTY OF ALAMEDA

DATE: 01/05/2015
DRAWN BY: ny
JOB NO.: 1303.22

A2

R1167631 5/2/16

PRIMARY (WORKBENCHES, MANAGERS, CONTRACTORS)
VIDEO / OFFICE
COMMUNITY & COLLABORATION
TEAM MEETING
CONFERENCE / ASSEMBLY
REFUGE



(8) WORK BENCHES
(1) MANAGER'S SEATING
(4) CONTRACTOR'S STATIONS
(1) VIDEO / OFFICE
(2) RESTROOMS
MDF ROOM

1/A3 MEZZANINE FLOOR PLAN
SCALE: 1/16" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
457 FIFTEENTH STREET
OAKLAND, CA 94612
PH: 510.444.8844 FAX: 510.444.8811

MEZZANINE

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

DATE: 01/06/2015
DRAWN BY: wy
JOB NO.: 1208.22

A3

R1167C31 5/16

PRIMARY (WORKBENCHES, MANAGERS, CONTRACTORS)

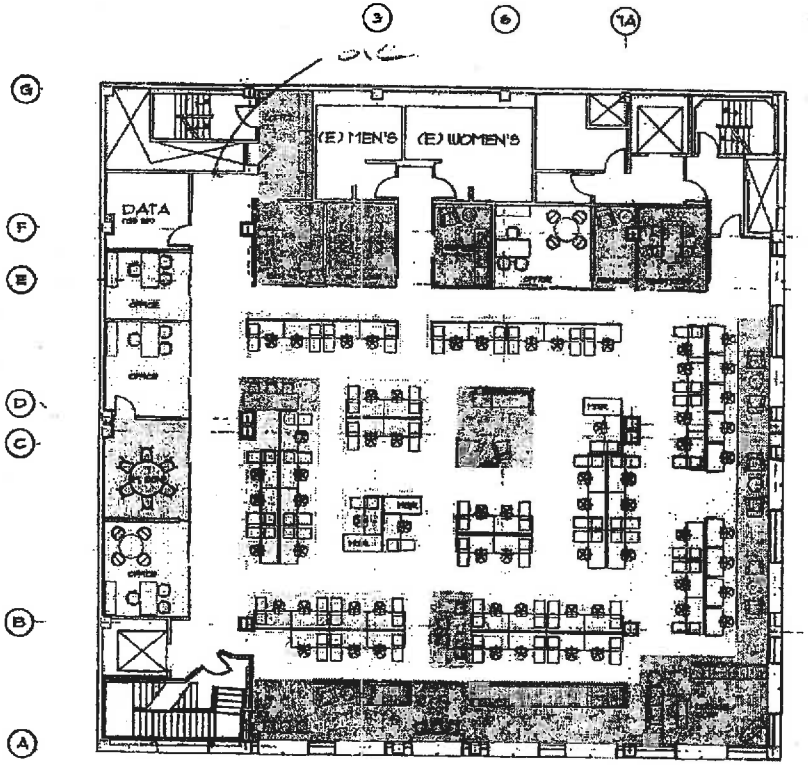
OFFICES

COMMUNITY + COLLABORATION

TEAM MEETING

CONFERENCE / ASSEMBLY

REFUGE



(52) WORK BENCHES
(3) MANAGER'S SEATING
(9) CONTRACTOR'S STATIONS
(4) OFFICES
(4) SMALL CONFERENCE
(1) BREAK
(1) COFFEE
(1) LOUNGE / CONFERENCE
(1) RETREAT

1/A4 SECOND FLOOR PLAN

SCALE: 1/16" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS

427 THIRTEENTH STREET
OAKLAND, CA 94612
PH: 510.444.2212 FX: 510.444.2212
kta@kta-arch.com www.kta-arch.com

SECOND FLOOR

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

GENERAL SERVICES AGENCY COUNTY OF ALAMEDA GSA

DATE: 01/06/2016
DRAWN BY: wy
JOB NO.: 1203.22

A4

04640

ASBESTOS TEM LABORATORIES, INC.

EPA Method 600/R-93/116
Polarized Light Microscopy
Analytical Report

Report No. 130657

1350 Freeport Blvd., Unit 104
Sparks, NV 89431
(775) 359-3377
FAX (775) 359-2798

With Main Office Located At:
630 Bancroft Way, Berkeley, CA 94710
Ph. (510) 704-8930 Fax (510) 704-8929

ASBESTOS TEM LABORATORIES, INC

NVLAP Lab Code 200104-0

Mar-08-16

S. Steiner
Terracon
1466 66th Street
Emeryville, CA 94608

RE: LABORATORY JOB Nc
Polarized light microscopy analytical results for 26 bulk sample(s) with 9 sample split(s)
Job Site: 393 13th Street
Job No.: R116 7284
Report No.: 130657

Enclosed please find the bulk material analytical results for one or more samples submitted for asbestos analysis. The analyses were performed in accordance with EPA Method 600/R-93/116 or 600/M4-82-020 for the determination of asbestos in bulk building materials by polarized light microscopy (PLM). Please note that while PLM analysis is commonly performed on non-friable and fine grained materials such as floor tiles and dust, the EPA method recognizes that PLM is subject to limitations. In these situations, accurate results may only be obtainable through the use of more sophisticated and accurate techniques such as transmission electron microscopy (TEM) or X-ray diffraction (XRD).

Prior to analysis, samples are logged-in and all data pertinent to the sample recorded. The samples are checked for damage or disruption of any chain-of-custody seals. A unique laboratory ID number is assigned to each sample. A hard copy log-in sheet containing all pertinent information concerning the sample is generated. This and all other relevant paper work are kept with the sample throughout the analytical procedures to assure proper analysis.

Each sample is opened in a class 100 HEPA negative air hood. A representative sampling of the material is selected and placed onto a glass microscope slide containing a drop of refractive index oil. The glass slide is placed under a polarizing light microscope where standard mineralogical techniques are used to analyze and quantify the various materials present, including asbestos. The data is then compiled into standard report format and subjected to a thorough quality assurance check before the information is released to the client.

Please note all samples will be held for 3 months from the date of receipt unless otherwise requested by client.

Sincerely Yours,

Laboratory Analyst
ASBESTOS TEM LABORATORIES, INC.

--- These results relate only to the samples tested and must not be reproduced, except in full, with the approval of the laboratory. This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government. ---

NVLAP Lab Code 200104-0

POLARIZED LIGHT MICROSCOPY ANALYTICAL REPORT

EPA Method 600/R-93/116 or 600/M4-82-020

Contact: S. Steiner

Address: Terracon
1466 66th Street
Emeryville, CA 94608

Samples Indicated: 26
Reg. Samples Analyzed: 26
Split Layers Analyzed: 9

Job Site / No. 393 13th Street
R116 7284

Report No. **130657**
Date Submitted: Mar-08-16
Date Reported: Mar-08-16

SAMPLE ID	ASBESTOS % TYPE	OTHER DATA 1) Non-Asbestos Fibers 2) Matrix Materials 3) Date/Time Collected 4) Date Analyzed	DESCRIPTION FIELD / LAB
19-RF6-19A. Split A Lab ID # 9071-00003-001A	**None Detected**	1)31-45% Cellulose,Synthetics 2)55-69% Tar, Other m.p.	Roof - Tar & Gravel - Main Field, East Side Upper Roof - South End
		3) 4) Mar-08-16	Roofing-Black
19-RF6-19A. Split B Lab ID # 9071-00003-001B	**None Detected**	1)50-60% Fiberglass 2)40-50% Tar, Other m.p.	Roof - Tar & Gravel - Main Field, East Side Upper Roof - South End
		3) 4) Mar-08-16	Roofing Felt/Tar-Black
19-RF6-19B. Split A Lab ID # 9071-00003-002A	**None Detected**	1)31-45% Cellulose,Synthetics 2)55-69% Tar, Other m.p.	Roof - Tar & Gravel - Main Field, East Side Upper Roof - Center Section
		3) 4) Mar-08-16	Roofing-Black
19-RF6-19B. Split B Lab ID # 9071-00003-002B	**None Detected**	1)50-60% Fiberglass 2)40-50% Tar, Other m.p.	Roof - Tar & Gravel - Main Field, East Side Upper Roof - Center Section
		3) 4) Mar-08-16	Roofing Felt/Tar-Black
19-RF6-19C. Split A Lab ID # 9071-00003-003A	**None Detected**	1)31-45% Cellulose,Synthetics 2)55-69% Tar, Other m.p.	Roof - Tar & Gravel - Main Field, East Side Upper Roof - North End Near Stair
		3) 4) Mar-08-16	Roofing-Black
19-RF6-19C. Split B Lab ID # 9071-00003-003B	**None Detected**	1)50-60% Fiberglass 2)40-50% Tar, Other m.p.	Roof - Tar & Gravel - Main Field, East Side Upper Roof - North End Near Stair
		3) 4) Mar-08-16	Roofing Felt/Tar-Black
19-RF6-19D. Split A Lab ID # 9071-00003-004A	**None Detected**	1)31-45% Cellulose,Synthetics 2)55-69% Tar, Other m.p.	Roof - Tar & Gravel - Main Field, East Side Middle Roof - North End Near Stair
		3) 4) Mar-08-16	Roofing-Black
19-RF6-19D. Split B Lab ID # 9071-00003-004B	**None Detected**	1)50-60% Fiberglass 2)40-50% Tar, Other m.p.	Roof - Tar & Gravel - Main Field, East Side Middle Roof - North End Near Stair
		3) 4) Mar-08-16	Roofing Felt/Tar-Black
19-RF6-19E. Split A Lab ID # 9071-00003-005A	**None Detected**	1)31-45% Cellulose,Synthetics 2)55-69% Tar, Other m.p.	Roof - Tar & Gravel - Main Field, East Side Middle Roof - Center Section
		3) 4) Mar-08-16	Roofing-Black
19-RF6-19E. Split B Lab ID # 9071-00003-005B	**None Detected**	1)50-60% Fiberglass 2)40-50% Tar, Other m.p.	Roof - Tar & Gravel - Main Field, East Side Middle Roof - Center Section
		3) 4) Mar-08-16	Roofing Felt/Tar-Black

Limit of quantitation of method is estimated to be 1% asbestos using a visual area estimation technique.
Split samples are inhomogeneous.

Laboratory Analyst Greg Hanes

ASBESTOS TEM LABORATORIES, INC. 1350 Freeport Blvd., Unit 104, Sparks, NV 89431 (775) 359-3377
With Main Office in Berkeley, CA (510) 704-8930

NVLAP®

NVLAP Lab Code 200104-0

POLARIZED LIGHT MICROSCOPY ANALYTICAL REPORT

EPA Method 600/R-93/116 or 600/M4-82-020

Contact: S. Steiner

Address: Terracon
1466 66th Street
Emeryville, CA 94608

Samples Indicated: 26
Reg. Samples Analyzed: 26
Split Layers Analyzed: 9

Job Site / No. 393 13th Street
R116 7284

Report No. 130657
Date Submitted: Mar-08-16
Date Reported: Mar-08-16

SAMPLE ID	ASBESTOS % TYPE	OTHER DATA 1) Non-Asbestos Fibers 2) Matrix Materials 3) Date/Time Collected 4) Date Analyzed	DESCRIPTION FIELD / LAB
19-RF6-19E. Split C Lab ID # 9071-00003-005C	None Detected	1) 50-60% Fiberglass 2) 40-50% Tar, Other m.p. 3) 4) Mar-08-16	Roof - Tar & Gravel - Main Field, East Side Middle Roof - Center Section Roofing Felt/Tar-Black
20-SC5-20A. Lab ID # 9071-00003-006	None Detected	1) 1-5% Cellulose 2) 95-99% Bndr, Calc, Gyp, Other m.p. 3) 4) Mar-08-16	HVAC- Duct Seam Sealant, Upper Roof - East Side - HVAC Unit Sealant-Green/Grey
20-SC5-20B. Lab ID # 9071-00003-007	None Detected	1) 1-5% Cellulose 2) 95-99% Bndr, Calc, Gyp, Other m.p. 3) 4) Mar-08-16	HVAC - Duct Seam Sealant, Upper Roof - East Side - HVAC Unit Sealant-Green/Grey
20-SC5-20C. Lab ID # 9071-00003-008	None Detected	1) 1-5% Cellulose 2) 95-99% Bndr, Calc, Gyp, Other m.p. 3) 4) Mar-08-16	HVAC - Duct Seam Sealant, Upper Roof - East Side - HVAC Unit Sealant-Green/Grey
21-WP1-21A. Lab ID # 9071-00003-009	None Detected	1) 70-80% Fiberglass 2) 20-30% Plast, Calc, Gyp, Other m.p. 3) 4) Mar-08-16	Vibration Joint Cloth (HVAC), Upper Roof - East Side - HVAC Unit Cloth-Black
21-WP1-21B. Lab ID # 9071-00003-010	None Detected	1) 70-80% Fiberglass 2) 20-30% Plast, Calc, Gyp, Other m.p. 3) 4) Mar-08-16	Vibration Joint Cloth (HVAC), Upper Roof - East Side - HVAC Unit Cloth-Black
21-WP1-21C. Lab ID # 9071-00003-011	None Detected	1) 70-80% Fiberglass 2) 20-30% Plast, Calc, Gyp, Other m.p. 3) 4) Mar-08-16	Vibration Joint Cloth (HVAC), Upper Roof - East Side - HVAC Unit Cloth-Black
22-SC7-22A. Lab ID # 9071-00003-012	None Detected	1) 1-5% Cellulose 2) 95-99% Bndr, Calc, Gyp, Other m.p. 3) 4) Mar-08-16	Roof Penetration Sealant (White), Upper Roof - East Side - South End Sealant-White/Grey
22-SC7-22B. Lab ID # 9071-00003-013	None Detected	1) 1-5% Cellulose 2) 95-99% Bndr, Calc, Gyp, Other m.p. 3) 4) Mar-08-16	Roof Penetration Sealant (White), Upper Roof - East Side - Center Sealant-White/Grey
22-SC7-22C. Lab ID # 9071-00003-014	None Detected	1) 1-5% Cellulose 2) 95-99% Bndr, Calc, Gyp, Other m.p. 3) 4) Mar-08-16	Roof Penetration Sealant (White), Middle Roof - North Side Sealant-White/Grey

Limit of quantitation of method is estimated to be 1% asbestos using a visual area estimation technique. Split samples are inhomogeneous.

Laboratory Analyst Greg Hanes

NVLAP Lab Code 200104-0

POLARIZED LIGHT MICROSCOPY ANALYTICAL REPORT

EPA Method 600/R-93/116 or 600/M4-82-020

Contact: S. Steiner

Address: Terracon
1466 66th Street
Emeryville, CA 94608

Samples Indicated: 26
Reg. Samples Analyzed: 26
Split Layers Analyzed: 9

Job Site / No. 393 13th Street
R116 7284

Report No. **130657**
Date Submitted: Mar-08-16
Date Reported: Mar-08-16

SAMPLE ID	ASBESTOS % TYPE	OTHER DATA 1) Non-Asbestos Fibers 2) Matrix Materials 3) Date/Time Collected 4) Date Analyzed	DESCRIPTION FIELD / LAB
23-SC5-23A. Lab ID # 9071-00003-015	**None Detected**	1) 1-5% Cellulose 2) 95-99% Bndr, Calc, Gyp, Other m.p. 3) 4) Mar-08-16	HVAC - Duct Seam Sealant, Lower Roof - West Side - HVAC Unit Sealant-Green/Grey
23-SC5-23B. Lab ID # 9071-00003-016	**None Detected**	1) 1-5% Cellulose 2) 95-99% Bndr, Calc, Gyp, Other m.p. 3) 4) Mar-08-16	HVAC - Duct Seam Sealant, Lower Roof - West Side - HVAC Unit Sealant-Green/Grey
23-SC5-23C. Lab ID # 9071-00003-017	**None Detected**	1) 1-5% Cellulose 2) 95-99% Bndr, Calc, Gyp, Other m.p. 3) 4) Mar-08-16	HVAC - Duct Seam Sealant, Lower Roof - West Side - HVAC Unit Sealant-Green/Grey
24-WP1-24A. Lab ID # 9071-00003-018	**None Detected**	1) <1% Cellulose 2) 100-100% Plast, Calc, Gyp, Other 3) 4) Mar-08-16	Lower Roof - West Side - HVAC Unit Roofing-Black
24-WP1-24B. Lab ID # 9071-00003-019	**None Detected**	1) <1% Cellulose 2) 100-100% Plast, Calc, Gyp, Other 3) 4) Mar-08-16	Lower Roof - West Side - HVAC Unit Roofing-Black
24-WP1-24C. Lab ID # 9071-00003-020	**None Detected**	1) <1% Cellulose 2) 100-100% Plast, Calc, Gyp, Other 3) 4) Mar-08-16	Lower Roof - West Side - HVAC Unit Roofing-Black
25-MG5-25A. Lab ID # 9071-00003-021	**None Detected**	1) 1-5% Cellulose,Fiberglass 2) 95-99% Bndr, Calc, Gyp, Other m.p. 3) 4) Mar-08-16	Residual Act Puck Mastic -(Brown) - Basement - Vault Room Concrete Ceiing Above T-Bar Mastic-Brown
25-MG5-25B. Lab ID # 9071-00003-022	**None Detected**	1) 1-5% Cellulose,Fiberglass 2) 95-99% Bndr, Calc, Gyp, Other m.p. 3) 4) Mar-08-16	Residual Act Puck Mastic -(Brown) - Basement - Vault Room Concrete Ceiing Above T-Bar Mastic-Brown
25-MG5-25C. Lab ID # 9071-00003-023	**None Detected**	1) 1-5% Cellulose,Fiberglass 2) 95-99% Bndr, Calc, Gyp, Other m.p. 3) 4) Mar-08-16	Residual Act Puck Mastic -(Brown) - Basement - Vault Room Concrete Ceiing Above T-Bar Mastic-Brown
26-MS5-26A. Split A Lab ID # 9071-00003-024A	**None Detected**	1) <1% Cellulose 2) 100-100% Calc, GlassFoam, Other 3) 4) Mar-08-16	Plaster Debris - Basement - Above T-Bar - Near Elevator Lobby Plaster White-White

Limit of quantitation of method is estimated to be 1% asbestos using a visual area estimation technique.
Split samples are inhomogeneous.

Laboratory Analyst Greg Hanes

NVLAP Lab Code 200104-0

POLARIZED LIGHT MICROSCOPY ANALYTICAL REPORT

EPA Method 600/R-93/116 or 600/M4-82-020

Contact: S. Steiner

Address: Terracon
1466 66th Street
Emeryville, CA 94608

Samples Indicated: 26
Reg. Samples Analyzed: 26
Split Layers Analyzed: 9

Job Site / No. 393 13th Street
R116 7284

Report No. 130657
Date Submitted: Mar-08-16
Date Reported: Mar-08-16

SAMPLE ID	ASBESTOS %	ASBESTOS TYPE	OTHER DATA (1) Non-Asbestos Fibers (2) Matrix Materials (3) Date/Time Collected (4) Date Analyzed	DESCRIPTION FIELD	DESCRIPTION LAB
26-MS5-26A. Split B Lab ID # 9071-00003-024B		None Detected	1) <1% Cellulose 2) 100-100% Calc, Qtz, Opq, Other	Plaster Debris - Basement - Above T-Bar - Near Elevator Lobby	
			3) 4) Mar-08-16	Plaster Grey-Grey	
26-MS5-26B. Split A Lab ID # 9071-00003-025A		None Detected	1) <1% Cellulose 2) 100-100% Calc, GlassFoam, Other	Plaster Debris - Basement - Above T-Bar - Near Elevator Lobby	
			3) 4) Mar-08-16	Plaster White-White	
26-MS5-26B. Split B Lab ID # 9071-00003-025B		None Detected	1) <1% Cellulose 2) 100-100% Calc, Qtz, Opq, Other	Plaster Debris - Basement - Above T-Bar - Near Elevator Lobby	
			3) 4) Mar-08-16	Plaster Grey-Grey	
26-MS5-26C. Split A Lab ID # 9071-00003-026A		None Detected	1) <1% Cellulose 2) 100-100% Calc, GlassFoam, Other	Plaster Debris - Basement - Above T-Bar - Near Elevator Lobby	
			3) 4) Mar-08-16	Plaster White-White	
26-MS5-26C. Split B Lab ID # 9071-00003-026B		None Detected	1) <1% Cellulose 2) 100-100% Calc, Qtz, Opq, Other	Plaster Debris - Basement - Above T-Bar - Near Elevator Lobby	
			3) 4) Mar-08-16	Plaster Grey-Grey	
Lab ID #			1) 2)		
			3) 4)		
Lab ID #			1) 2)		
			3) 4)		
Lab ID #			1) 2)		
			3) 4)		
Lab ID #			1) 2)		
			3) 4)		
Lab ID #			1) 2)		
			3) 4)		

Limit of quantitation of method is estimated to be 1% asbestos using a visual area estimation technique. Split samples are inhomogeneous.

Laboratory Analyst Greg Hanes

Terracon

☒ PM – S. Steiner spsteiner@terracon.com	☐ PM – K. Schroeter kmschroeter@terracon.com	☐ PM – K. Pilgrim kmpilgrim@terracon.com
☐ PM – M. Bryant mvbryant@terracon.com	☐ PM – T. Kattchee takattchee@terracon.com	☐ PM – B. Gils regils@terracon.com
☐ PM- M. Benefield msbenefield@terracon.com	☐ PM D. Ufferfilge dufferfilge@terracon.com	☐ PM – M. Bishop mrbishop@terracon.com
☐ PM – W. Frieszell wmfrieszell@terracon.com		

ACM BULK SAMPLE DATA SHEET

☑ PLM Analysis (Analyze all samples)
☐ Stop Analysis at First Positive
☐ Point Count Analysis (400-point)

PAGE 1 OF 3

Project Name/ Address/ Building No. 393 13TH ST.

Project# R1167284 **Sampled By:** M. REED **Sampling Date:** 3-7-16

Sample(s) sent to: ☐ RGA ☐ EMSL ☐ Other _____ **TAT** ☐ Rush ☒ 24HRS ☐ 3-5 days

FAX OR E-MAIL REPORT TO: *SEE ABOVE PROJECT MANAGER (PM)

***ADDITIONAL REPORT RECIPIENT(S): _____ ***

HM# 19	Material Description ROOF - TAR AND GRAVEL - MAIN FIELD	
Sample ID	Sample Location & Material Location	Quantity:
1 19-RF6-19A	EAST SIDE UPPER ROOF - (S) END	
2 " "-19B	" " - CENTER SECTION	
3 " "-19C	" " - (N) END NEAR STAIR	
HM# 19	Material Description: CONTINUE	
Sample ID	Sample Location & Material Location	Quantity:
4 19-RF6-19D	EAST SIDE - MIDDLE ROOF - (N) END NEAR STAIR	
5 " " 19E	" " - CENTER SECTION	
HM# 20	Material Description: HVAC - DUCT SEAM SEALANT	
Sample ID	Sample Location & Material Location	Quantity:
6 20-SLS-20A	UPPER ROOF - EAST SIDE - HVAC UNIT	
7 " "-20B	" "	
8 " "-20C	" "	
HM# 21	Material Description: VIBRATION JOINT CLOTH (HVAC)	
Sample ID	Sample Location & Material Location	Quantity:
9 21-WP1-21A	UPPER ROOF - EAST SIDE - HVAC UNIT	
10 " "-21B	" "	
11 " "-21C	" "	

Relinquished By:	M. REED	Signature:	M. Reed	Date/Time:	3-7-16
Received By:	ASATEN	Signature:	[signature]	Date/ Time:	3/7/16@1411
Relinquished By:		Signature:		Date/Time:	
Received By:		Signature:		Date/Time:	

Terracon

☑ PM – S. Steiner spsteiner@terracon.com	☐ PM – K. Schroeter kmschroeter@terracon.com	☐ PM – K. Pilgrim kmpilgrim@terracon.com
☐ PM – M. Bryant mvbryant@terracon.com	☐ PM – T. Kattchee takattchee@terracon.com	☐ PM – B. Gils regils@terracon.com
☐ PM- M. Benefield msbenefield@terracon.com	☐ PM D. Ufferfilge dufferfilge@terracon.com	☐ PM – M. Bishop mrbishop@terracon.com
☐ PM – W. Frieszell wmfrieszell@terracon.com		

ACM BULK SAMPLE DATA SHEET

☑ PLM Analysis (Analyze all samples)
☐ Stop Analysis at First Positive
☐ Point Count Analysis (400-point)

Project Name/ Address/ Building No. 393 13TH ST.

Project# R1167284 **Sampled By:** M. REED **Sampling Date:** 3-7-16

Sample(s) sent to: ☐ RGA ☐ EMSL ☐ Other _____ **TAT** ☐ Rush ☑ 24HRS ☐ 3-5 days

FAX OR E-MAIL REPORT TO: *SEE ABOVE PROJECT MANAGER (PM)**

***ADDITIONAL REPORT RECIPIENT(S): _____ ***

	HM# 22	**Material Description** ROOF PENETRATION SEALANT (WHITE)
	Sample ID	**Sample Location & Material Location** **Quantity:**
12	22-SCT-22A	UPPER ROOF - (E) SIDE - (S) END
13	" " -22B	" " - CENTER
14	" " -22C	MIDDLE ROOF - (N) SIDE
	HM# 23	**Material Description:** HVAC - DUCT SEAM SEALANT
	Sample ID	**Sample Location & Material Location** **Quantity:**
15	23-SCS-23A	LOWER ROOF - (W) SIDE - HVAC UNIT
16	" " -23B	" "
17	" " -23C	" "
	HM# 24	**Material Description:** VIBRATION JOINT CLOTH (HVAC)
	Sample ID	**Sample Location & Material Location** **Quantity:**
18	24-WPI-24A	LOWER ROOF - (W) SIDE - HVAC UNIT
19	" " -24B	" "
20	" " -24C	" "
	HM# 25	**Material Description:** RESIDUAL ACT PUCK MASTIC (BROWN)
	Sample ID	**Sample Location & Material Location** **Quantity:**
21	25-MLS-25A	BASEMENT - VAULT ROOM CONCRETE CEILING - ABOVE T-BAR
22	" " -25B	" " "
23	" " -25C	" " "

Relinquished By:	M. REED	**Signature:**	M. Reed	**Date/Time:**	3-7-16
Received By:		**Signature:**		**Date/ Time:**	
Relinquished By:		**Signature:**		**Date/Time:**	
Received By:		**Signature:**		**Date/Time:**	

Terracon

☑ PM – S. Steiner spsteiner@terracon.com	☐ PM – K. Schroeter kmschroeter@terracon.com	☐ PM – K. Pilgrim kmpilgrim@terracon.com
☐ PM – M. Bryant mvbryant@terracon.com	☐ PM – T. Kattchee takattchee@terracon.com	☐ PM – B. Gils regils@terracon.com
☐ PM- M. Benefield msbenefield@terracon.com	☐ PM D. Ufferfilge dufferfilge@terracon.com	☐ PM – M. Bishop mrbishop@terracon.com
☐ PM – W. Frieszell wmfrieszell@terracon.com		

ACM BULK SAMPLE DATA SHEET

☑ PLM Analysis (Analyze all samples)
☐ Stop Analysis at First Positive
☐ Point Count Analysis (400-point)

PAGE 3 OF 3

Project Name/ Address/ Building No. 393 13TH ST.

Project# R1167284 Sampled By: M. REED Sampling Date: 3-7-16

Sample(s) sent to: ☐ RGA ☐ EMSL ☐ Other _____ TAT ☐ Rush ☒ 24HRS ☐ 3-5 days

FAX OR E-MAIL REPORT TO: *SEE ABOVE PROJECT MANAGER (PM)**

***ADDITIONAL REPORT RECIPIENT(S): _____ ***

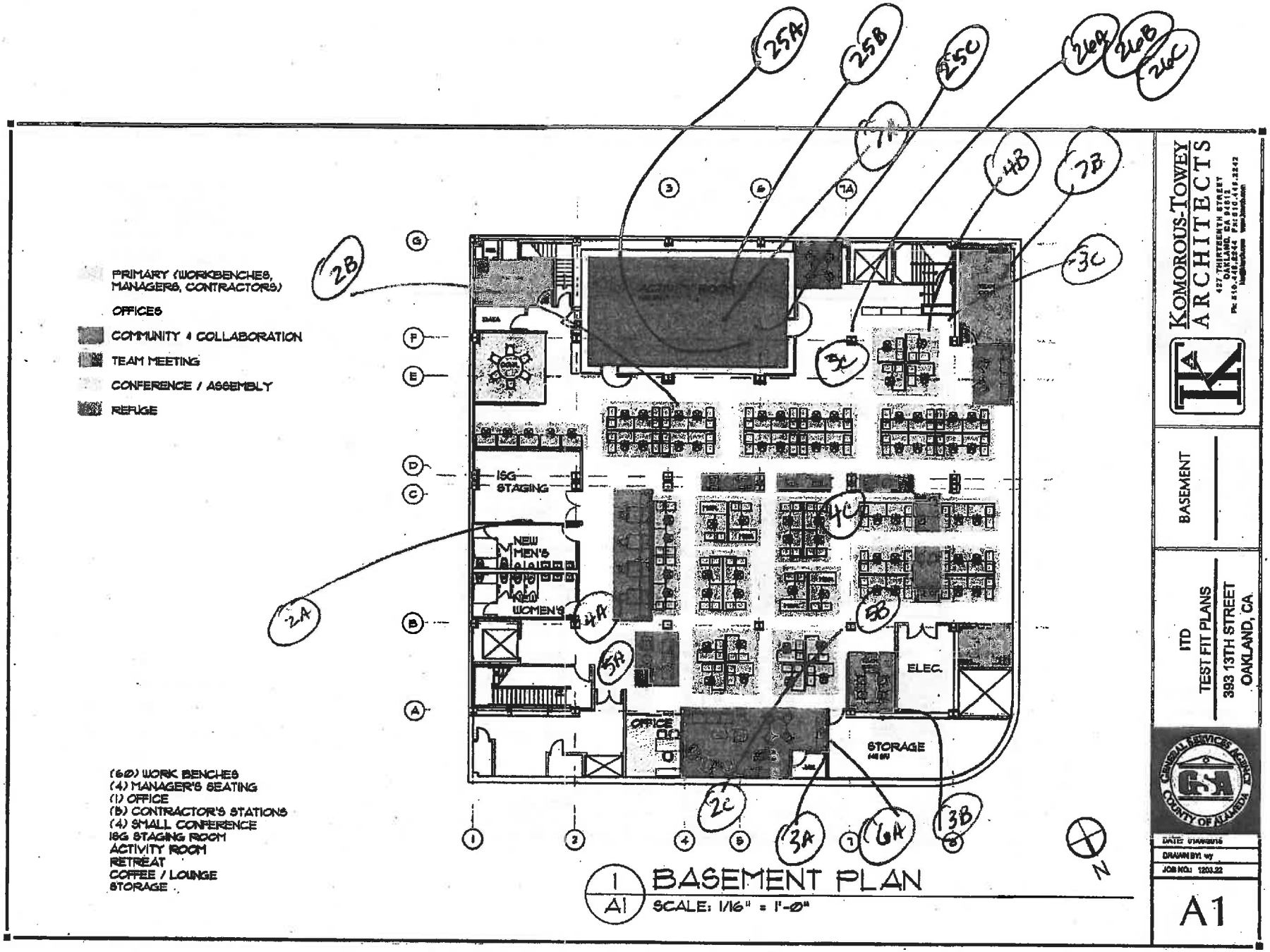
	HM# 26	Material Description PLASTER DEBRIS	
	Sample ID	Sample Location & Material Location	Quantity:
24	26-MS5-26A	BASEMENT - ABOVE T-BAR - NEAR ELEVATOR LOBBY	
25	" " -26B	" " - " " - "	"
26	" " -26C	" " - " " - "	"

HM#	Material Description:	
Sample ID	Sample Location & Material Location	Quantity:

HM#	Material Description:	
Sample ID	Sample Location & Material Location	Quantity:

HM#	Material Description:	
Sample ID	Sample Location & Material Location	Quantity:

Relinquished By:	M. REED	Signature:	M. R	Date/Time:	3-7-16
Received By:		Signature:		Date/ Time:	
Relinquished By:		Signature:		Date/Time:	
Received By:		Signature:		Date/Time:	



1 / A1 BASEMENT PLAN

SCALE: 1/16" = 1'-0"

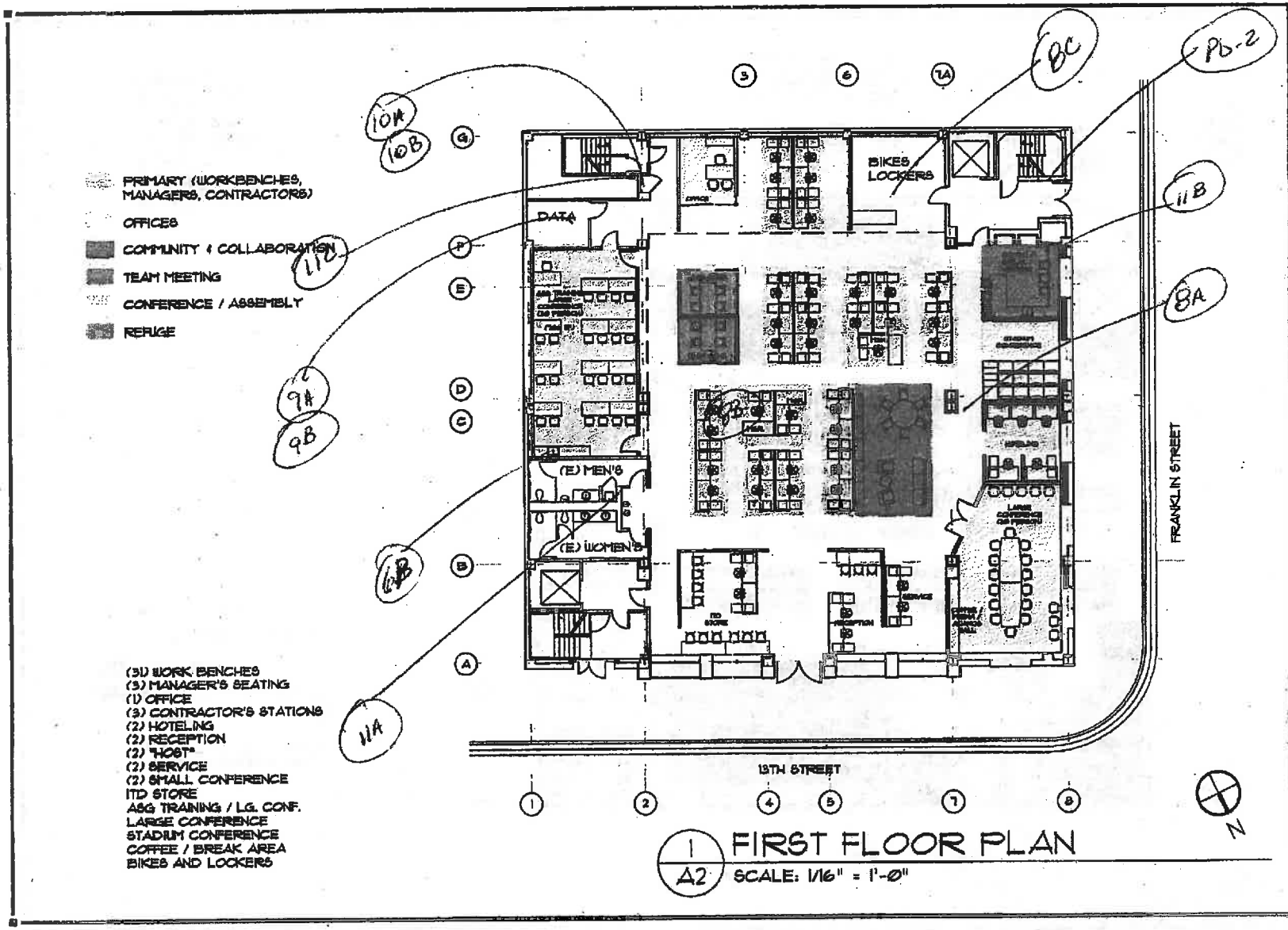
KOMOROUS-TOWEY ARCHITECTS

BASEMENT

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

DATE: 01/19/2016
DRAWN BY: wy
JOB NO.: 1203.22

A1



1 / A2 FIRST FLOOR PLAN
SCALE: 1/16" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
427 THIRTEENTH STREET
OAKLAND, CA. 94612
PH: 510.444.2344 FX: 510.444.2344

FIRST FLOOR

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

GENERAL SERVICES AGENCY
COUNTY OF ALAMEDA

DATE: 01/05/2015
DRAWN BY: wg
JOB NO.: 1203.22

A2

PRIMARY (WORKBENCHES, MANAGERS, CONTRACTORS)

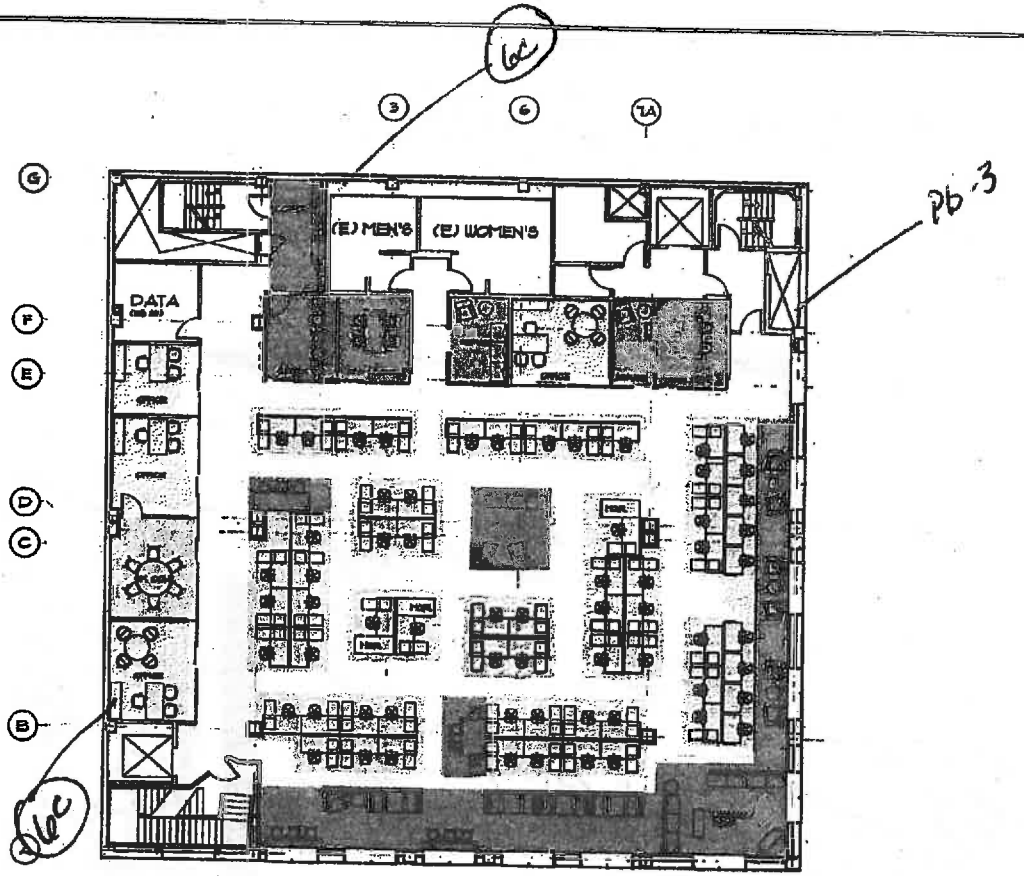
OFFICES

COMMUNITY & COLLABORATION

TEAM MEETING

CONFERENCE / ASSEMBLY

REFUGE



(52) WORK BENCHES
(3) MANAGER'S SEATING
(9) CONTRACTOR'S STATIONS
(4) OFFICES
(4) SMALL CONFERENCE
(1) BREAK
(1) COFFEE
(1) LOUNGE / CONFERENCE
(1) RETREAT

1/A4 SECOND FLOOR PLAN

SCALE: 1/16" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
427 THIRTEENTH STREET
OAKLAND, CA 94612
Ph: 510.444.2244 Fx: 510.444.2242

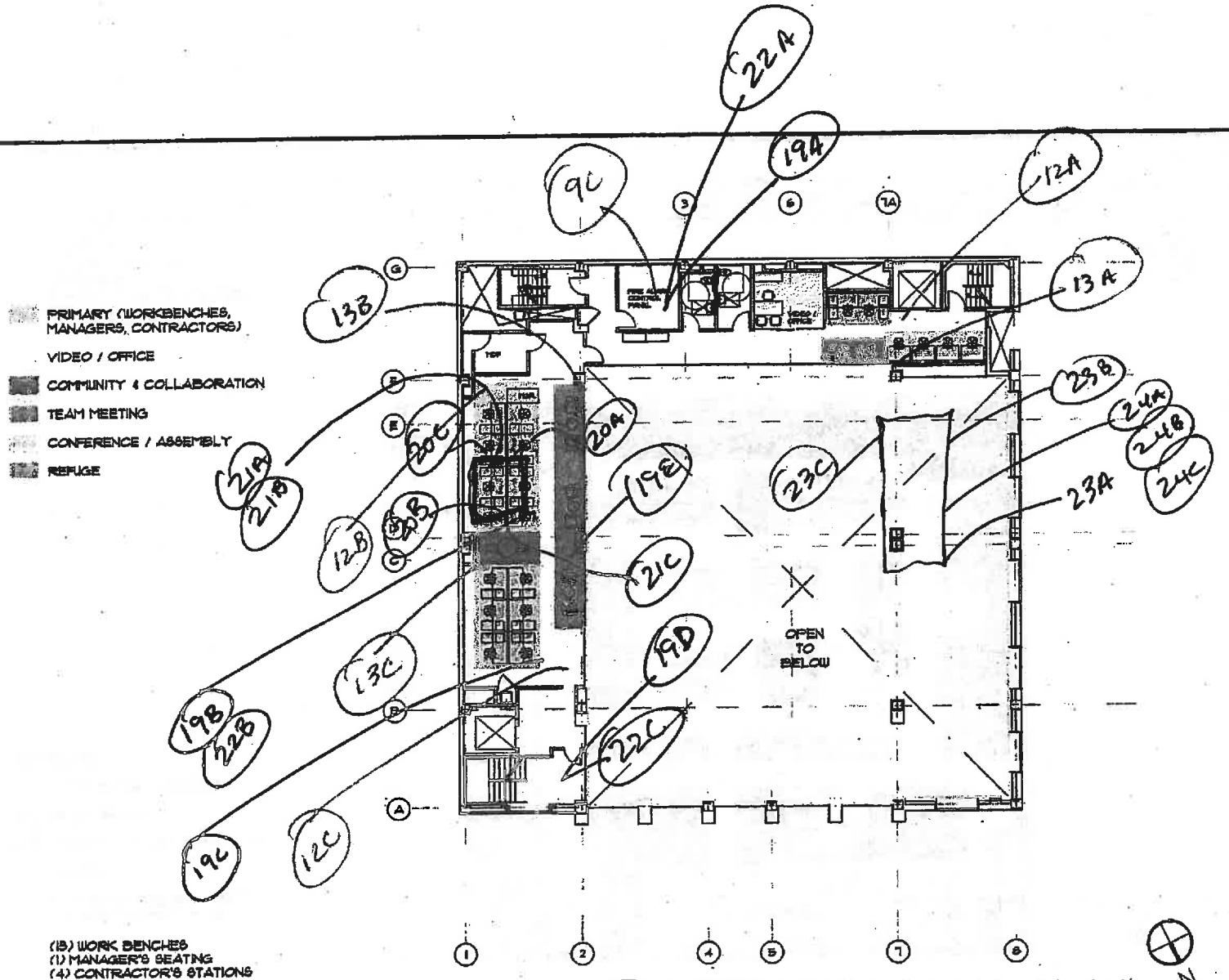
SECOND FLOOR

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

GENERAL SERVICES AGENCY
COUNTY OF ALAMEDA

DATE: 01/05/2015
DRAWN BY: KY
JOB NO.: 1303.22

A4



1/A3 MEZZANINE FLOOR PLAN

SCALE: 1/16" = 1'-0"

N

KOMOROUS-TOWEY ARCHITECTS

427 THIRTEENTH STREET
OAKLAND, CA 94612
Ph: 510.444.2244 Fx: 510.444.2242

MEZZANINE

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

GSA GENERAL SERVICES ADMINISTRATION COUNTY OF ALAMEDA

DATE: 01/08/2015
DRAWN BY: wy
JOB NO.: 1303.22

A3

PRIMARY (WORKBENCHES, MANAGERS, CONTRACTORS)

OFFICES

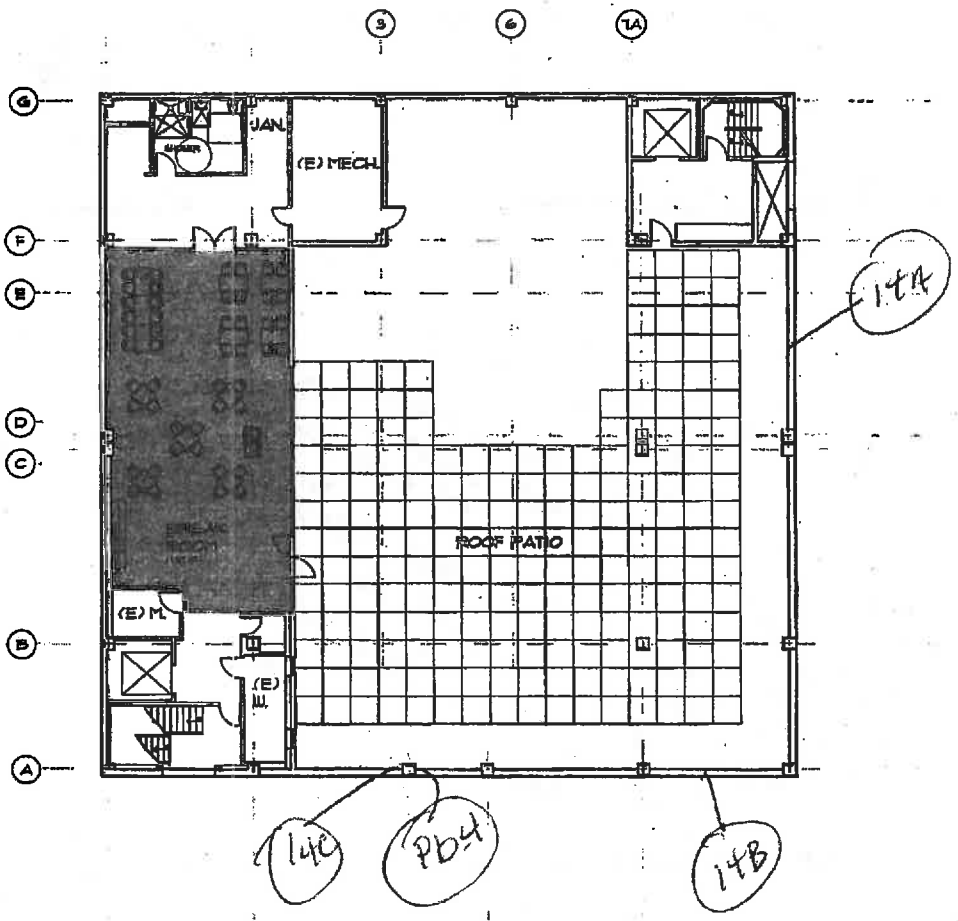
COMMUNITY & COLLABORATION

TEAM MEETING

CONFERENCE / ASSEMBLY

REFUGE

BREAK ROOM
ROOF PATIO
SHOWER



1 / A5 THIRD FLOOR PLAN

SCALE: 1/8" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
431 THIRTEENTH STREET
OAKLAND, CA 94612
PH: 510.444.3344 FX: 510.444.3442

THIRD FLOOR

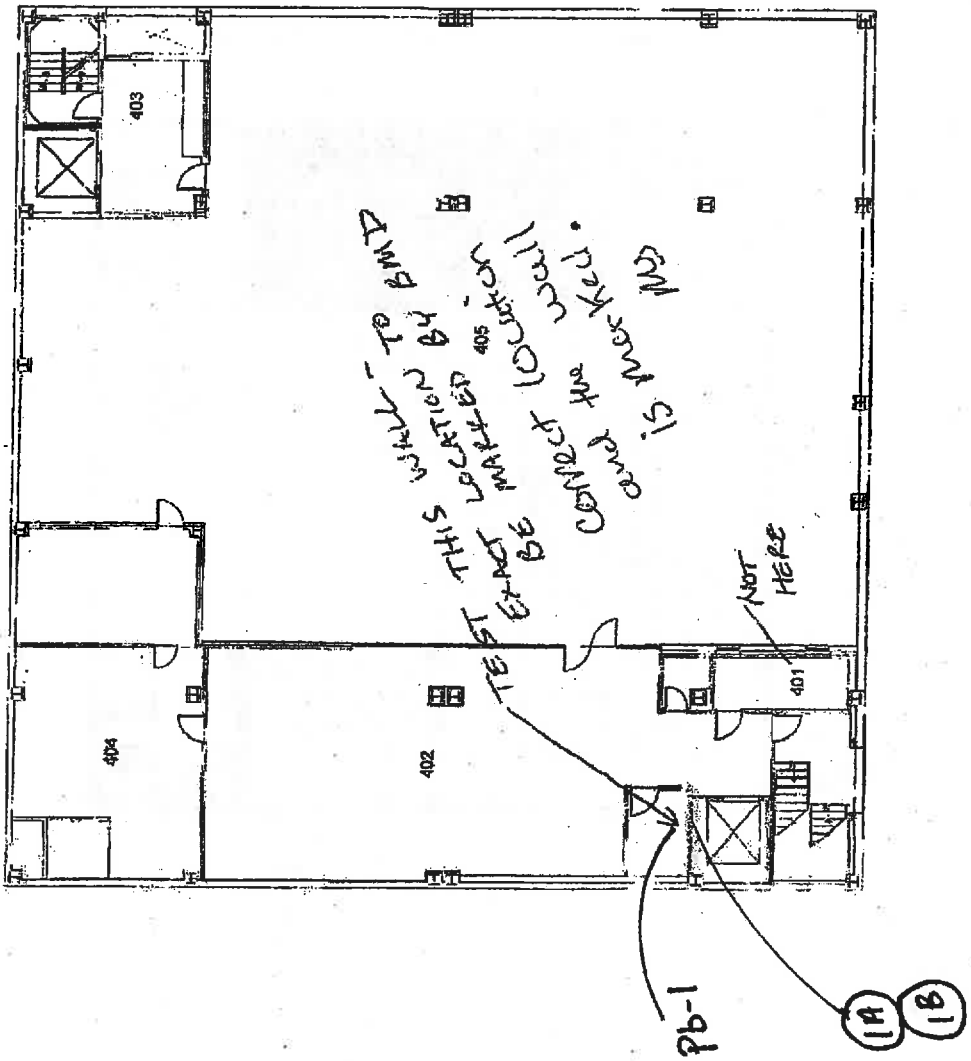
ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

GSA GENERAL SERVICES ADMINISTRATION COUNTY OF ALAMEDA

DATE: 01/08/2015
DRAWN BY: wy
JOB NO.: 1203.22

A5

Bldg #-Drawing Name-Floor:	04640-DCSS-4th Flr.			USF:	1,666
Building Name:	DCSS		Print Date:		1/4/2008
Street Address:	393 13th Street		City:		Oakland



04640

Exp 12/30/15

ASBESTOS TEM LABORATORIES, INC.

EPA Interim Method
Polarized Light Microscopy
Analytical Report

Laboratory Job # 338298

600 Bancroft Way, Ste. A
Berkeley, CA 94710
(510) 704-8930
FAX (510) 704-8429
www.asbestostemlabs.com

With Branch Offices Located At:
1350 FREEPORT BLVD. UNIT 104, SPARKS, NV 89431
Ph. (775) 359-3377

ASBESTOS TEM LABORATORIES, INC

CA DPH ELAP
Lab No. 1866

NVLAP®
NVLAP Lab Code: 101891-0
Berkeley, CA

Dec-22-15

S. Steiner
Terracon Consultants, Inc.
1260 45th Street
Emeryville, CA 94608

RE: LABORATORY JOB # 338298
Polarized light microscopy analytical results for 5 bulk sample(s).
Job Site: 393 13th Street Oakland, California Northeast Elevator
Job No.: R1158364

Enclosed please find the bulk material analytical results for one or more samples submitted for asbestos analysis. The analyses were performed in accordance with EPA Method 600/R-93/116 or 600/M4-82-020 for the determination of asbestos in bulk building materials by polarized light microscopy (PLM). Please note that while PLM analysis is commonly performed on non-friable and fine grained materials such as floor tiles and dust, the EPA method recognizes that PLM is subject to limitations. In these situations, accurate results may only be obtainable through the use of more sophisticated and accurate techniques such as transmission electron microscopy (TEM) or X-ray diffraction (XRD).

Prior to analysis, samples are logged-in and all data pertinent to the sample recorded. The samples are checked for damage or disruption of any chain-of-custody seals. A unique laboratory ID number is assigned to each sample. A hard copy log-in sheet containing all pertinent information concerning the sample is generated. This and all other relevant paper work are kept with the sample throughout the analytical procedures to assure proper analysis.

Each sample is opened in a class 100 HEPA negative air hood. A representative sampling of the material is selected and placed onto a glass microscope slide containing a drop of refractive index oil. The glass slide is placed under a polarizing light microscope where standard mineralogical techniques are used to analyze and quantify the various materials present, including asbestos. The data is then compiled into a standard report format and reviewed by the authorized signatory before being released to the client.

Sincerely Yours,

Lab Manager
ASBESTOS TEM LABORATORIES, INC.

--- These results relate only to the samples tested and must not be reproduced, except in full, with the approval of the laboratory. This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government. ---

Note: Test samples will be stored for three months after data of receipt, after which they will be properly disposed unless client makes other arrangements with the laboratory.

POLARIZED LIGHT MICROSCOPY
ANALYTICAL REPORT

EPA Method 600/R-93/116 or 600/M4-82-020

Contact: S. Steiner

Address: Terracon Consultants, Inc.
1260 45th Street
Emeryville, CA 94608

Samples Indicated: 5
Reg. Samples Analyzed: 5
Split Layers Analyzed: 0

Report No. **338298**
Date Submitted: Dec-22-15
Date Reported: Dec-22-15

Job Site / No. 393 13th Street Oakland, California Northeast Elevator
R1158364

SAMPLE ID	ASBESTOS % TYPE	OTHER DATA 1) Non-Asbestos Fibers 2) Matrix Materials 3) Date/Time Collected 4) Date Analyzed	DESCRIPTION FIELD / LAB
01-HP4-01	None Detected	1) 6-15% Fiberglass, Cellulose 2) 85-94% Calc, Gyp, Other m.p.	White Plaster - 1st Floor north elevator wall west
Lab ID # 1434-00633-001		3) 4) Dec-22-15	Plaster-White
01-HP4-02	None Detected	1) 6-15% Fiberglass, Cellulose 2) 85-94% Calc, Gyp, Other m.p.	White Plaster - 1st Floor north elevator wall middle
Lab ID # 1434-00633-002		3) 4) Dec-22-15	Plaster-White
01-HP4-03	None Detected	1) 6-15% Fiberglass, Cellulose 2) 85-94% Calc, Gyp, Other m.p.	White Plaster - 1st Floor north elevator wall east
Lab ID # 1434-00633-003		3) 4) Dec-22-15	Plaster-White
01-HP4-04	None Detected	1) 6-15% Fiberglass, Cellulose 2) 85-94% Calc, Gyp, Other m.p.	Base cove mastic - mezzanine north elevator wall
Lab ID # 1434-00633-004		3) 4) Dec-22-15	Plaster-White
01-HP4-05	None Detected	1) 6-15% Fiberglass, Cellulose 2) 85-94% Calc, Gyp, Other m.p.	Base cove mastic - mezzanine south elevator wall
Lab ID # 1434-00633-005		3) 4) Dec-22-15	Plaster-White
Lab ID #		1) 2) 3) 4)	
Lab ID #		1) 2) 3) 4)	
Lab ID #		1) 2) 3) 4)	
Lab ID #		1) 2) 3) 4)	
Lab ID #		1) 2) 3) 4)	

Detection Limit of Method is Estimated to be 1% Asbestos Using a Visual Area Estimation Technique

Analyst Jo Ann Hewitt

ASBESTOS TEM LABORATORIES, INC.
www.asbestostemlabs.com
600 Bancroft Way, Ste. A, Berkeley CA 94710 (510) 704-8930
With Offices in Reno, NV (775) 359-3377

Terracon

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☐PM – M. Bryant mvbryant@terracon.com	☐PM – T. Kallichee takallichee@terracon.com	☐PM – B. Gils regils@terracon.com
☐PM- M. Benefield msbenefield@terracon.com	☐PM D. Ufferfige dufferfige@terracon.com	☐PM – M. Bishop mrbishop@terracon.com
☐PM – W. Friedzell wmfriedzell@terracon.com		

ACM BULK SAMPLE DATA SHEET
☒PLM Analysis (Analyze all samples)
☐ Stop Analysis at First Positive
☐ Point Count Analysis (400-point)

PAGE 1 OF 1

Project Name/ Address/ Building No. 393 13th Street Oakland, California Northeast elevator

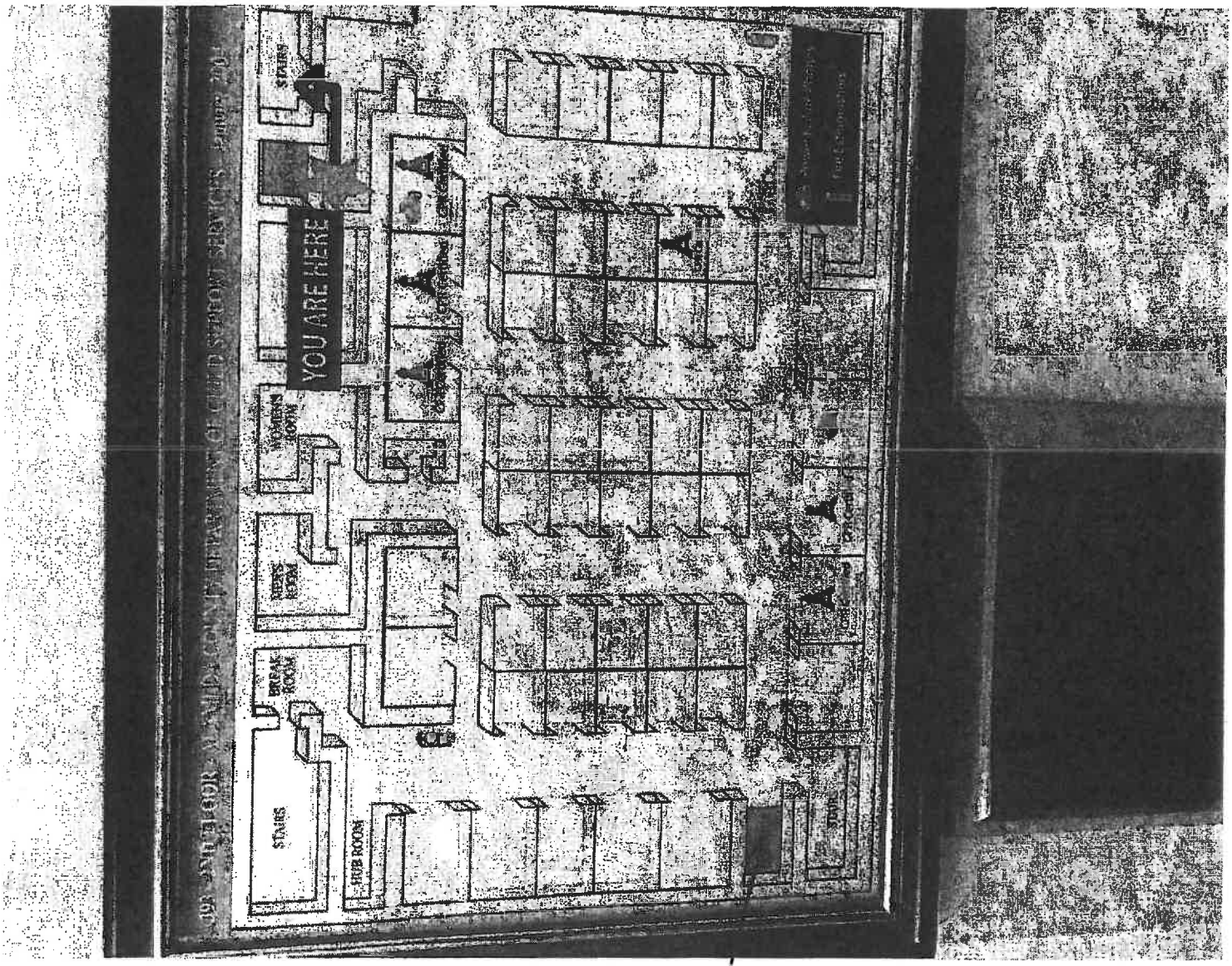
Project# R1158364 **Sampled By:** John Urban **Sampling Date:** 12-22-15

Sample(s) sent to: ☐ RGA ☐ EMSL ☒ Other _____ **TAT** ☐ Rush ☒ 24HRS ☐ 3-5 days

FAX OR E-MAIL REPORT TO: *SEE ABOVE PROJECT MANAGER (PM)**
***ADDITIONAL REPORT RECIPIENT(S): John@rgaenv.com ***

HM# 1	Material Description: White plaster	
Sample ID	Sample Location & Material Location	Quantity:
01-HP4-01	1st floor north elevator wall west	
01-HP4-02	1st floor north elevator wall middle	
01-HP4-03	1st floor north elevator wall east	
HM# 1	Material Description: ~~Base cove mastic~~ WHITE PLASTER JU	
Sample ID	Sample Location & Material Location	Quantity:
01-HP4-04	Mezzanine north elevator wall	
01-HP4-05	Mezzanine south elevator wall	
HM#	Material Description:	
Sample ID	Sample Location & Material Location	Quantity:
HM#	Material Description:	
Sample ID	Sample Location & Material Location	Quantity:

Relinquished By:	John Urban	Signature:	John Urban	Date/Time:	12-22-15
Received By:	[signature]	Signature:	[signature]	Date/ Time:	12-23-15 9:30 AM
Relinquished By:		Signature:		Date/Time:	
Received By:		Signature:		Date/Time:	



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EXTERIOR 12/21/12

MICRO ANALYTICAL LABORATORIES, INC.

BULK ASBESTOS ANALYSIS - PLM (EPA/600/R-93/116, 1993)

1075
Chris Yama
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Oakland, CA 94621

PROJECT:
DCSS
393 13TH STREET
OAKLAND, CA
PROJECT NO. 2062-003

Micro Log In	**143287**
Total Samples	77
Date Sampled	08/18/2010
Date Received	08/18/2010
Date Analyzed	08/19/2010

ASBESTOS INFORMATION

SAMPLE IDENTIFICATION	QUANTITY (AREA %) / TYPES / LAYERS / DISTINCT SAMPLES	DOMINANT OTHER MATERIALS
Client #: BA-1-1 Micro #: 143287-01 Analyst: LZ WHITE BASE ADHESIVE ROOM 104 1ST FLOOR	BASE: NONE DETECTED ADHESIVE: NONE DETECTED	Matrix Type: SYNTHETIC MATERIAL
Client #: BA-1-2 Micro #: 143287-02 Analyst: LZ WHITE BASE ADHESIVE ROOM 113 1ST FLOOR	BASE: NONE DETECTED ADHESIVE: NONE DETECTED	Matrix Type: SYNTHETIC MATERIAL
Client #: BA-1-3 Micro #: 143287-03 Analyst: LZ WHITE BASE ADHESIVE ROOM 107 1ST FLOOR	BASE: NONE DETECTED ADHESIVE: NONE DETECTED	Matrix Type: SYNTHETIC MATERIAL
Client #: CT-2-1 Micro #: 143287-04 Analyst: LZ 2X4 CEILING TILE FISSURES ROOM 108 1ST FLOOR	CEILING TILE: NONE DETECTED PAINT: NONE DETECTED	30 % CELLULOSE Matrix Type: GLASS FRAGMENTS, BINDER
Client #: CT-2-2 Micro #: 143287-05 Analyst: LZ 2X4 CEILING TILE FISSURES ROOM 113 1ST FLOOR	CEILING TILE: NONE DETECTED PAINT: NONE DETECTED	30 % CELLULOSE Matrix Type: GLASS FRAGMENTS, BINDER

Technical Supervisor: _____ 8/22/2010
Gamini Ranatunga, Ph.D. Date Reported

Asbestos is quantified by calibrated visual estimation. Detection limit is material dependent. Detection of asbestos traces (much less than 1%) may not be reliable or reproducible by PLM. Weight % cannot be determined by PLM. Asbestos with diameter below ~1 µm may not be detected by PLM. Absence of asbestos in dust, debris, and some compact materials, including floor tiles, cannot be conclusively established by PLM, and should be confirmed by Transmission Electron Microscopy (TEM). The lower quantitation limit (reporting limit) of PLM estimation is 1%. The Cal-OSHA definition of asbestos-containing construction material is 0.1% asbestos; however, reliable determination of asbestos percent at this level cannot be done by PLM estimation; PLM Point Counting or TEM is recommended. Only dominant non-asbestos materials are indicated. Interferences may prevent detection of small asbestos fibers, and hinder determination of some optical properties. Sample heterogeneity is indicated by listing more than one distinct layer or material on the report. Layers are analyzed separately when feasible; if asbestos is detected, percentages are reported for individual layers. Interlayer contamination is possible among any layers in a sample. Composite asbestos percentages are applicable only to wallboard / joint compound systems; compositing is based on customers' descriptions of material as "joint compound". Customers are solely responsible for identification and description of bulk materials listed on field forms. Laboratory descriptions may differ from those given by customers. Quality Control (QC): all results have been determined to be within acceptance limits prior to reporting. Samples that were reanalyzed are denoted by two sets of analyst initials. Accreditation: NIST / NVLAP (Lab Code 101872-0). CA ELAP Certification #1037. EPA 1993 method is based on EPA Interim Method (1982), with improved analytical techniques. Unless otherwise stated herein, all samples were received in acceptable condition for analysis. This report must not be used to claim product endorsement by NIST or any U.S. Government agency. This report shall not be reproduced without the approval of Micro Analytical Laboratories, Inc., shall not be reproduced except in full, and pertains only to the samples analyzed. ND = NO ASBESTOS DETECTED.

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SAMPLE IDENTIFICATION	ASBESTOS INFORMATION QUANTITY (AREA %) / TYPES / LAYERS / DISTINCT SAMPLES	DOMINANT OTHER MATERIALS
Client #: CT-2-3 Micro #: 143287-06 Analyst: LZ 2X4 CEILING TILE FISSURES ROOM 114 1ST FLOOR	CEILING TILE: NONE DETECTED PAINT: NONE DETECTED	30 % CELLULOSE Matrix Type: GLASS FRAGMENTS, BINDER.
Client #: PL-3-1 Micro #: 143287-07 Analyst: LZ PLASTER WITH TEXTURE, WALLS CONCEALED BY DRYWALL ROOM 114 1ST FLOOR	PLASTER: NONE DETECTED TEXTURE: NONE DETECTED PAINT: NONE DETECTED	Matrix Type: SYNTHETIC MATERIAL, CARBONATE, ADHESIVE.
Client #: PL-3-2 Micro #: 143287-08 Analyst: LZ PLASTER WITH TEXTURE, WALLS CONCEALED BY DRYWALL ROOM 114 1ST FLOOR	PLASTER: NONE DETECTED TEXTURE: NONE DETECTED PAINT: NONE DETECTED	Matrix Type: SYNTHETIC MATERIAL, CARBONATE, ADHESIVE.
Client #: PL-3-3 Micro #: 143287-09 Analyst: LZ PLASTER WITH TEXTURE, WALLS CONCEALED BY DRYWALL ROOM 114 1ST FLOOR	PLASTER: NONE DETECTED TEXTURE: NONE DETECTED PAINT: NONE DETECTED	Matrix Type: SYNTHETIC MATERIAL, CARBONATE, ADHESIVE.
Client #: PL-3-4 Micro #: 143287-10 Analyst: LZ PLASTER WITH TEXTURE, WALLS CONCEALED BY DRYWALL ROOM 114 1ST FLOOR	PLASTER: NONE DETECTED TEXTURE: NONE DETECTED PAINT: NONE DETECTED	Matrix Type: SYNTHETIC MATERIAL, CARBONATE, ADHESIVE.

Technical Supervisor: Gamini Ranatunga, Ph.D. 8/22/2010 Date Reported

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ASBESTOS INFORMATION

SAMPLE IDENTIFICATION	QUANTITY (AREA %) / TYPES / LAYERS / DISTINCT SAMPLES	DOMINANT OTHER MATERIALS
Client #: **PL-3-5** Micro #: 143287-11 Analyst: LZ **PLASTER WITH TEXTURE, WALLS CONCEALED BY DRYWALL ROOM 114 1ST FLOOR**	**PLASTER: NONE DETECTED** **TEXTURE: NONE DETECTED** **PAINT: NONE DETECTED**	Matrix Type: **SYNTHETIC MATERIAL, CARBONATE, ADHESIVE.**
Client #: **CA-6-1** Micro #: 143287-12 Analyst: LZ **YELLOW CARPET ADHESIVE ROOM 104 1ST FLOOR**	**CARPET: NONE DETECTED** **ADHESIVE: NONE DETECTED**	70 % SYNTHETIC FIBERS Matrix Type: **SYNTHETIC MATERIAL**
Client #: **CA-6-2** Micro #: 143287-13 Analyst: LZ **YELLOW CARPET ADHESIVE ROOM 107 1ST FLOOR**	**CARPET: NONE DETECTED** **ADHESIVE: NONE DETECTED**	70 % SYNTHETIC FIBERS Matrix Type: **SYNTHETIC MATERIAL**
Client #: **JC-7-1** Micro #: 143287-14 Analyst: LZ AF **DRYWALL AND JOINT COMPOUND ROOM 104 1ST FLOOR**	**DRYWALL: NONE DETECTED** **JOINT COMPOUND: NONE DETECTED** **PAINT: NONE DETECTED**	10 % CELLULOSE 5 % FIBROUS GLASS Matrix Type: **'GYPSUM' (CALCIUM SULFATE), CARBONATE.**
Client #: **JC-7-2** Micro #: 143287-15 Analyst: LZ **DRYWALL AND JOINT COMPOUND ROOM 101 1ST FLOOR**	**DRYWALL: NONE DETECTED** **JOINT COMPOUND: NONE DETECTED** **PAINT: NONE DETECTED**	10 % CELLULOSE 5 % FIBROUS GLASS Matrix Type: **'GYPSUM' (CALCIUM SULFATE), CARBONATE.**

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Client #: JC-7-3 Micro #: 143287-16 Analyst: LZ DRYWALL AND JOINT COMPOUND ROOM 114 1ST FLOOR	DRYWALL: NONE DETECTED JOINT COMPOUND: NONE DETECTED PAINT: NONE DETECTED	10 % CELLULOSE 5 % FIBROUS GLASS Matrix Type: 'GYPSUM' (CALCIUM SULFATE), CARBONATE.
Client #: JC-7-4 Micro #: 143287-17 Analyst: LZ DRYWALL AND JOINT COMPOUND ROOM 113 1ST FLOOR	DRYWALL: NONE DETECTED JOINT COMPOUND: NONE DETECTED PAINT: NONE DETECTED	10 % CELLULOSE 5 % FIBROUS GLASS Matrix Type: 'GYPSUM' (CALCIUM SULFATE), CARBONATE.
Client #: JC-7-5 Micro #: 143287-18 Analyst: LZ DRYWALL AND JOINT COMPOUND ROOM 107 1ST FLOOR	DRYWALL: NONE DETECTED JOINT COMPOUND: NONE DETECTED	10 % CELLULOSE 5 % FIBROUS GLASS Matrix Type: 'GYPSUM' (CALCIUM SULFATE), CARBONATE.
Client #: CA-8-1 Micro #: 143287-19 Analyst: LZ YELLOW AND BROWN CARPET ADHESIVE ROOM 117	CARPET: NONE DETECTED ADHESIVE (YELLOW / BROWN): NONE DETECTED	70 % SYNTHETIC FIBERS Matrix Type: SYNTHETIC MATERIAL
Client #: FA-9-1 Micro #: 143287-20 Analyst: LZ 12"X12" GRAY PEBBLE TILE BLACK ADHESIVE ROOM 113	TILE: NONE DETECTED ADHESIVE: NONE DETECTED	Matrix Type: SYNTHETIC MATERIAL, CARBONATE, ADHESIVE.

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SAMPLE IDENTIFICATION	QUANTITY (AREA %) / TYPES / LAYERS / DISTINCT SAMPLES	DOMINANT OTHER MATERIALS
Client #: BA-32-1 Micro #: 143287-21 Analyst: LZ BROWN AND WHITE BASE ADHESIVE ROOM 7 BASEMENT	BASE: NONE DETECTED ADHESIVE (BROWN): NONE DETECTED ADHESIVE (WHITE): NONE DETECTED	Matrix SYNTHETIC MATERIAL, Type: CARBONATE, ADHESIVE.
Client #: BA-32-2 Micro #: 143287-22 Analyst: LZ BROWN AND WHITE BASE ADHESIVE ROOM 41 BASEMENT	BASE: NONE DETECTED ADHESIVE (BROWN): NONE DETECTED ADHESIVE (WHITE): NONE DETECTED	Matrix SYNTHETIC MATERIAL, Type: CARBONATE, ADHESIVE.
Client #: FA-33-1 Micro #: 143287-23 Analyst: LZ 12X12 WHITE WITH TAN YELLOW ADHESIVE ROOM 7 BASEMENT	FLOOR TILE: NONE DETECTED ADHESIVE: NONE DETECTED	Matrix SYNTHETIC MATERIAL, Type: CARBONATE, ADHESIVE.
Client #: PL-34-1 Micro #: 143287-24 Analyst: LZ AF PLASTER ROOM 6 BASEMENT	PLASTER: <1% TREMOLITE & ACTINOLITE ASBESTOS	Matrix ROCK FRAGMENTS, Type: CARBONATE, BINDER
Client #: PL-34-2 Micro #: 143287-25 Analyst: LZ PLASTER ROOM 6 BASEMENT	NONE DETECTED	Matrix ROCK FRAGMENTS, Type: CARBONATE, BINDER

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SAMPLE IDENTIFICATION	ASBESTOS INFORMATION QUANTITY (AREA %) / TYPES / LAYERS / DISTINCT SAMPLES	DOMINANT OTHER MATERIALS
Client #: PL-34-3 Micro #: 143287-26 Analyst: LZ PLASTER ROOM 6 BASEMENT	NONE DETECTED	Matrix Type: ROCK FRAGMENTS, CARBONATE, BINDER
Client #: PL-34-4 Micro #: 143287-27 Analyst: LZ PLASTER ROOM 41 BASEMENT	PLASTER: NONE DETECTED SKIM COAT: NONE DETECTED PAINT: NONE DETECTED	Matrix Type: ROCK FRAGMENTS, CARBONATE, BINDER
Client #: PL-34-5 Micro #: 143287-28 Analyst: LZ PLASTER ROOM 42 BASEMENT	PLASTER: NONE DETECTED SKIM COAT: NONE DETECTED PAINT: NONE DETECTED	Matrix Type: ROCK FRAGMENTS, CARBONATE, BINDER
Client #: PL-34-6 Micro #: 143287-29 Analyst: LZ PLASTER ROOM 9 BASEMENT	PLASTER: NONE DETECTED SKIM COAT: NONE DETECTED PAINT: NONE DETECTED	Matrix Type: ROCK FRAGMENTS, CARBONATE, BINDER
Client #: SU-35-1 Micro #: 143287-30 Analyst: LZ STUCCO ROOM 2 BASEMENT	STUCCO: NONE DETECTED PAINT: NONE DETECTED	Matrix Type: ROCK FRAGMENTS, CARBONATE, BINDER

Technical Supervisor: for Gamini Ranatunga, Ph.D. 8/22/2010 Date Reported

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ASBESTOS INFORMATION

SAMPLE IDENTIFICATION	QUANTITY (AREA %) / TYPES / LAYERS / DISTINCT SAMPLES	DOMINANT OTHER MATERIALS
Client #: **SU-35-2** Micro #: 143287-31 Analyst: LZ **STUCCO** **ROOM 2 BASEMENT**	**STUCCO: NONE DETECTED** **PAINT: NONE DETECTED**	Matrix Type: **ROCK FRAGMENTS, CARBONATE, BINDER**
Client #: **SU-35-3** Micro #: 143287-32 Analyst: LZ AF **STUCCO** **ROOM 2 BASEMENT**	**NONE DETECTED**	Matrix Type: **ROCK FRAGMENTS, CARBONATE, BINDER**
Client #: **BA-36-1** Micro #: 143287-33 Analyst: LZ **WHITE BASE ADHESIVE** **OUTSIDE ROOM 2 BASEMENT**	**BASE: NONE DETECTED** **ADHESIVE: NONE DETECTED**	Matrix Type: **SYNTHETIC MATERIAL**
Client #: **SK-37-1** Micro #: 143287-34 Analyst: LZ **WHITE SINK UNDERCOAT** **ROOM 14 - OUTSIDE**	**NONE DETECTED**	**10 % CELLULOSE** Matrix Type: **SYNTHETIC MATERIAL**
Client #: **FA-38-1** Micro #: 143287-35 Analyst: LZ **12X12 TAN MARBLE** **YELLOW ADHESIVE** **ROOM 15**	**FLOOR TILE: NONE DETECTED** **ADHESIVE: NONE DETECTED**	Matrix Type: **SYNTHETIC MATERIAL, CARBONATE, ADHESIVE**

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Oakland, CA 94621

PROJECT:
DCSS
393 13TH STREET
OAKLAND, CA
PROJECT NO. 2062-003

Micro Log In	**143287**
Total Samples	77
Date Sampled	08/18/2010
Date Received	08/18/2010
Date Analyzed	08/19/2010

SAMPLE IDENTIFICATION	ASBESTOS INFORMATION QUANTITY (AREA %) / TYPES / LAYERS / DISTINCT SAMPLES	DOMINANT OTHER MATERIALS
Client #: CA-39-1 Micro #: 143287-36 Analyst: LZ BROWN AND YELLOW CARPET ADHESIVE ROOM 41	CARPET: NONE DETECTED ADHESIVE (BROWN / YELLOW): NONE DETECTED RESIDUAL ADHESIVE (BLACK): 15% CHRYSOTILE ASBESTOS	70 % SYNTHETIC FIBERS Matrix Type: SYNTHETIC MATERIAL
Client #: FA-40-1 Micro #: 143287-37 Analyst: LZ 12X12 WHITE PEBBLE BLACK ADHESIVE ROOM 9	FLOOR TILE: NONE DETECTED ADHESIVE: NONE DETECTED	Matrix Type: SYNTHETIC MATERIAL, CARBONATE, ADHESIVE.
Client #: BA-20-2 Micro #: 143287-38 Analyst: LZ WHITE BASE ADHESIVE ROOM 324 2ND FLOOR	BASE: NONE DETECTED ADHESIVE: NONE DETECTED	Matrix Type: SYNTHETIC MATERIAL
Client #: BA-21-1 Micro #: 143287-39 Analyst: LZ WHITE BASE ADHESIVE ROOM 402 3RD FLOOR	BASE: NONE DETECTED ADHESIVE: NONE DETECTED	Matrix Type: SYNTHETIC MATERIAL
Client #: FA-22-1 Micro #: 143287-40 Analyst: LZ 12X12 BEIGE WITH YELLOW ADHESIVE ROOM 402 3RD FLOOR	FLOOR TILE: NONE DETECTED ADHESIVE: NONE DETECTED	Matrix Type: SYNTHETIC MATERIAL, CARBONATE, ADHESIVE.

Technical Supervisor: Gamini Ranatunga, Ph.D. 8/22/2010 Date Reported

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MICRO ANALYTICAL LABORATORIES, INC.

BULK ASBESTOS ANALYSIS - PLM (EPA/600/R-93/116, 1993)

1075
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SAMPLE IDENTIFICATION	QUANTITY (AREA %) / TYPES / LAYERS / DISTINCT SAMPLES	DOMINANT OTHER MATERIALS
Client #: FA-22-2 Micro #: 143287-41 Analyst: LZ 12X12 BEIGE WITH YELLOW ADHESIVE ROOM 402 3RD FLOOR	FLOOR TILE: NONE DETECTED ADHESIVE: NONE DETECTED	Matrix SYNTHETIC MATERIAL, Type: CARBONATE, ADHESIVE.
Client #: FA-23-1 Micro #: 143287-42 Analyst: LZ 12X12 BLACK WITH YELLOW ADHESIVE ROOM 402 3RD FLOOR	FLOOR TILE: NONE DETECTED ADHESIVE: NONE DETECTED	Matrix SYNTHETIC MATERIAL, Type: CARBONATE, ADHESIVE.
Client #: FA-24-1 Micro #: 143287-43 Analyst: LZ 12X12 PEACH WITH YELLOW ADHESIVE ROOM 402 3RD FLOOR	FLOOR TILE: NONE DETECTED ADHESIVE: NONE DETECTED	Matrix SYNTHETIC MATERIAL, Type: CARBONATE, ADHESIVE.
Client #: FA-25-1 Micro #: 143287-44 Analyst: LZ 12X12 YELLOW WITH YELLOW ADHESIVE ROOM 402 3RD FLOOR	FLOOR TILE: NONE DETECTED ADHESIVE: NONE DETECTED	Matrix SYNTHETIC MATERIAL, Type: CARBONATE, ADHESIVE.
Client #: JC-26-1 Micro #: 143287-45 Analyst: LZ AF DRYWALL AND JOINT COMPOUND ROOM 404 3RD FLOOR	DRYWALL: NONE DETECTED JOINT COMPOUND: NONE DETECTED PAINT: NONE DETECTED	20 % CELLULOSE 2 % FIBROUS GLASS Matrix 'GYPSUM' (CALCIUM SULFATE), Type: CARBONATE.

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Client #: JC-26-2 Micro #: 143287-46 Analyst: LZ DRYWALL AND JOINT COMPOUND ROOM 404 3RD FLOOR	DRYWALL: NONE DETECTED JOINT COMPOUND: NONE DETECTED PAINT: NONE DETECTED	20 % CELLULOSE 2 % FIBROUS GLASS Matrix Type: 'GYPSUM' (CALCIUM SULFATE), CARBONATE.
Client #: MI-27-1 Micro #: 143287-47 Analyst: LZ CONCRETE WALL ROOM 406	NONE DETECTED	Matrix Type: CARBONATE.
Client #: SK-28-1 Micro #: 143287-48 Analyst: LZ AF WHITE SINK UNDERCOAT ROOM 114 1ST FLOOR	NONE DETECTED	10 % CELLULOSE Matrix Type: CARBONATE.
Client #: JC-29-1 Micro #: 143287-49 Analyst: LZ DRYWALL AND JOINT COMPOUND OUTSIDE ROOM 7 BASEMENT	DRYWALL: NONE DETECTED JOINT COMPOUND: NONE DETECTED	20 % CELLULOSE 2 % FIBROUS GLASS Matrix Type: 'GYPSUM' (CALCIUM SULFATE), CARBONATE.
Client #: JC-29-2 Micro #: 143287-50 Analyst: LZ DRYWALL AND JOINT COMPOUND ROOM 7 BASEMENT	DRYWALL: NONE DETECTED JOINT COMPOUND: NONE DETECTED PAINT: NONE DETECTED	20 % CELLULOSE 2 % FIBROUS GLASS Matrix Type: 'GYPSUM' (CALCIUM SULFATE), CARBONATE.

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Client #: JC-29-3 Micro #: 143287-51 Analyst: LZ DRYWALL AND JOINT COMPOUND OUTSIDE ROOM 2 BASEMENT	DRYWALL: NONE DETECTED JOINT COMPOUND: NONE DETECTED PAINT: NONE DETECTED	20 % CELLULOSE 2 % FIBROUS GLASS Matrix Type: 'GYPSUM' (CALCIUM SULFATE), CARBONATE.
Client #: JC-29-4 Micro #: 143287-52 Analyst: LZ DRYWALL AND JOINT COMPOUND ROOM 14 BASEMENT	DRYWALL: NONE DETECTED JOINT COMPOUND: NONE DETECTED PAINT: NONE DETECTED	20 % CELLULOSE 2 % FIBROUS GLASS Matrix Type: 'GYPSUM' (CALCIUM SULFATE), CARBONATE.
Client #: JC-29-5 Micro #: 143287-53 Analyst: LZ DRYWALL AND JOINT COMPOUND ROOM 9 BASEMENT	DRYWALL: NONE DETECTED JOINT COMPOUND: NONE DETECTED PAINT: NONE DETECTED	20 % CELLULOSE 2 % FIBROUS GLASS Matrix Type: 'GYPSUM' (CALCIUM SULFATE), CARBONATE.
Client #: CT-30-1 Micro #: 143287-54 Analyst: LZ AF 2X4 CEILING TILE OUTSIDE ROOM 7 BASEMENT	CEILING TILE: NONE DETECTED PAINT: NONE DETECTED	30 % CELLULOSE Matrix Type: GLASS FRAGMENTS, BINDER.
Client #: WT-31-1 Micro #: 143287-55 Analyst: LZ WALL TEXTURE ON CONCRETE ROOM 7 BASEMENT	TEXTURE: NONE DETECTED PAINT: NONE DETECTED	Matrix Type: CARBONATE.

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Client #: WT-31-2 Micro #: 143287-56 Analyst: LZ WALL TEXTURE ON CONCRETE ROOM 7 BASEMENT	CONCRETE: NONE DETECTED TEXTURE: NONE DETECTED PAINT: NONE DETECTED	Matrix Type: CARBONATE.
Client #: WT-31-3 Micro #: 143287-57 Analyst: LZ WALL TEXTURE ON CONCRETE ROOM 7 BASEMENT	CONCRETE: NONE DETECTED TEXTURE: NONE DETECTED PAINT: NONE DETECTED	Matrix Type: CARBONATE.
Client #: CT-18-1 Micro #: 143287-58 Analyst: LZ 2X4 CEILING TILE ROOM 202 MEZZANINE	CEILING TILE: NONE DETECTED PAINT: NONE DETECTED	30 % CELLULOSE Matrix Type: GLASS FRAGMENTS, BINDER.
Client #: CT-18-2 Micro #: 143287-59 Analyst: LZ 2X4 CEILING TILE ROOM 206 MEZZANINE	CEILING TILE: NONE DETECTED PAINT: NONE DETECTED	30 % CELLULOSE Matrix Type: GLASS FRAGMENTS, BINDER.
Client #: JC-11-1 Micro #: 143287-60 Analyst: LZ DRYWALL AND JOINT COMPOUND ROOM 206 MEZZANINE	DRYWALL: NONE DETECTED JOINT COMPOUND: NONE DETECTED PAINT: NONE DETECTED	20 % CELLULOSE 2 % FIBROUS GLASS Matrix Type: 'GYPSUM' (CALCIUM SULFATE), CARBONATE.

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Client #: **JC-11-2** Micro #: 143287-61 Analyst: LZ **DRYWALL AND JOINT COMPOUND** **ROOM 202 MEZZANINE**	**DRYWALL: NONE DETECTED** **JOINT COMPOUND: NONE DETECTED** **PAINT: NONE DETECTED**	20 % CELLULOSE 2 % FIBROUS GLASS Matrix Type: 'GYPSUM' (CALCIUM SULFATE), CARBONATE.
Client #: **CA-12-1** Micro #: 143287-62 Analyst: LZ AF **YELLOW CARPET ADHESIVE** **ROOM 206 MEZZANINE**	**NONE DETECTED**	Matrix Type: SYNTHETIC MATERIAL
Client #: **BA-12-1** Micro #: 143287-63 Analyst: LZ **WHITE BASE ADHESIVE** **ROOM 206 MEZZANINE**	**BASE: NONE DETECTED** **ADHESIVE: NONE DETECTED**	Matrix Type: SYNTHETIC MATERIAL
Client #: **FA-14-1** Micro #: 143287-64 Analyst: LZ **12X12 WHITE PEBBLE** **BLACK ADHESIVE** **ROOM 202 MEZZANINE**	**FLOOR TILE: NONE DETECTED** **ADHESIVE: NONE DETECTED**	Matrix Type: SYNTHETIC MATERIAL, CARBONATE, ADHESIVE.
Client #: **MI-15-1** Micro #: 143287-65 Analyst: LZ **RED FIRE STOP** **ROOM 320 2ND FLOOR**	**NONE DETECTED**	Matrix Type: SYNTHETIC MATERIAL

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Client #: CT-16-1 Micro #: 143287-66 Analyst: LZ 2X4 CEILING TILE ROOM 306	CEILING TILE: NONE DETECTED PAINT: NONE DETECTED	30 % CELLULOSE Matrix Type: GLASS FRAGMENTS, BINDER.
Client #: CT-16-2 Micro #: 143287-67 Analyst: LZ 2X4 CEILING TILE ROOM 320	CEILING TILE: NONE DETECTED PAINT: NONE DETECTED	30 % CELLULOSE Matrix Type: GLASS FRAGMENTS, BINDER.
Client #: FA-17-1 Micro #: 143287-68 Analyst: LZ 12X12 GRAY PEBBLE BLACK ADHESIVE ROOM 320	FLOOR TILE: NONE DETECTED ADHESIVE: NONE DETECTED	Matrix Type: SYNTHETIC MATERIAL, CARBONATE, ADHESIVE.
Client #: JC-18-1 Micro #: 143287-69 Analyst: LZ DRYWALL AND JOINT COMPOUND ROOM 320	DRYWALL: NONE DETECTED JOINT COMPOUND: NONE DETECTED PAINT: NONE DETECTED	20 % CELLULOSE 2 % FIBROUS GLASS Matrix Type: 'GYPSUM' (CALCIUM SULFATE), CARBONATE.
Client #: JC-18-2 Micro #: 143287-70 Analyst: LZ DRYWALL AND JOINT COMPOUND ROOM 306	DRYWALL: NONE DETECTED JOINT COMPOUND: NONE DETECTED PAINT: NONE DETECTED	20 % CELLULOSE 2 % FIBROUS GLASS Matrix Type: 'GYPSUM' (CALCIUM SULFATE), CARBONATE.

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SAMPLE IDENTIFICATION	QUANTITY (AREA %) / TYPES / LAYERS / DISTINCT SAMPLES	DOMINANT OTHER MATERIALS
Client #: JC-18-3 Micro #: 143287-71 Analyst: LZ DRYWALL AND JOINT COMPOUND OUTSIDE ROOM 305	DRYWALL: NONE DETECTED JOINT COMPOUND: NONE DETECTED PAINT: NONE DETECTED	20 % CELLULOSE 2 % FIBROUS GLASS Matrix Type: 'GYPSUM' (CALCIUM SULFATE), CARBONATE.
Client #: JC-18-4 Micro #: 143287-72 Analyst: LZ DRYWALL AND JOINT COMPOUND ROOM 303	DRYWALL: NONE DETECTED JOINT COMPOUND: NONE DETECTED PAINT: NONE DETECTED	20 % CELLULOSE 2 % FIBROUS GLASS Matrix Type: 'GYPSUM' (CALCIUM SULFATE), CARBONATE.
Client #: JC-18-5 Micro #: 143287-73 Analyst: LZ DRYWALL AND JOINT COMPOUND ROOM 307	DRYWALL: NONE DETECTED JOINT COMPOUND: NONE DETECTED PAINT: NONE DETECTED	20 % CELLULOSE 2 % FIBROUS GLASS Matrix Type: 'GYPSUM' (CALCIUM SULFATE), CARBONATE.
Client #: JC-18-6 Micro #: 143287-74 Analyst: LZ DRYWALL AND JOINT COMPOUND ROOM 324	DRYWALL: NONE DETECTED JOINT COMPOUND: NONE DETECTED PAINT: NONE DETECTED	20 % CELLULOSE 2 % FIBROUS GLASS Matrix Type: 'GYPSUM' (CALCIUM SULFATE), CARBONATE.
Client #: CA-19-1 Micro #: 143287-75 Analyst: LZ YELLOW CARPET ADHESIVE ROOM 306	ADHESIVE: NONE DETECTED	Matrix Type: SYNTHETIC MATERIAL

Technical Supervisor: _____ 8/22/2010
Gamini Ranatunga, Ph.D. Date Reported

Asbestos is quantified by calibrated visual estimation. Detection limit is material dependent. Detection of asbestos traces (much less than 1%) may not be reliable or reproducible by PLM. Weight % cannot be determined by PLM. Asbestos with diameter below ~1 µm may not be detected by PLM. Absence of asbestos in dust, debris, and some compact materials, including floor tiles, cannot be conclusively established by PLM, and should be confirmed by Transmission Electron Microscopy (TEM). The lower quantitation limit (reporting limit) of PLM estimation is 1%. The Cal-OSHA definition of asbestos-containing construction material is 0.1% asbestos; however, reliable determination of asbestos percent at this level cannot be done by PLM estimation; PLM Point Counting or TEM is recommended. Only dominant non-asbestos materials are indicated. Interferences may prevent detection of small asbestos fibers, and hinder determination of some optical properties. Sample heterogeneity is indicated by listing more than one distinct layer or material on the report. Layers are analyzed separately when feasible; if asbestos is detected, percentages are reported for individual layers. Interlayer contamination is possible among any layers in a sample. Composite asbestos percentages are applicable only to wallboard / joint compound systems; compositing is based on customers' descriptions of material as "joint compound". Customers are solely responsible for identification and description of bulk materials listed on field forms. Laboratory descriptions may differ from those given by customers. Quality Control (QC): all results have been determined to be within acceptance limits prior to reporting. Samples that were reanalyzed are denoted by two sets of analyst initials. Accreditation: NIST / NVLAP (Lab Code 101872-0). CA ELAP Certification #1037. EPA 1993 method is based on EPA Interim Method (1982), with improved analytical techniques. Unless otherwise stated herein, all samples were received in acceptable condition for analysis. This report must not be used to claim product endorsement by NIST or any U.S. Government agency. This report shall not be reproduced without the approval of Micro Analytical Laboratories, Inc., shall not be reproduced except in full, and pertains only to the samples analyzed. ND = NO ASBESTOS DETECTED.

MICRO ANALYTICAL LABORATORIES, INC.

BULK ASBESTOS ANALYSIS - PLM (EPA/600/R-93/116, 1993)

1075
Chris Yama
A.C.C. Environmental Consultants
7977 Capwell Drive, Suite 100
Oakland, CA 94621

PROJECT:
DCSS
393 13TH STREET
OAKLAND, CA
PROJECT NO. 2062-003

Micro Log In	**143287**
Total Samples	77
Date Sampled	08/18/2010
Date Received	08/18/2010
Date Analyzed	08/19/2010

SAMPLE IDENTIFICATION	ASBESTOS INFORMATION QUANTITY (AREA %) / TYPES / LAYERS / DISTINCT SAMPLES	DOMINANT OTHER MATERIALS
Client #: **CA-19-2** Micro #: 143287-76 Analyst: LZ **YELLOW CARPET ADHESIVE** **ROOM 324**	**CARPET: NONE DETECTED** **ADHESIVE: NONE DETECTED**	70 % SYNTHETIC FIBERS Matrix Type: **SYNTHETIC MATERIAL**
Client #: **BA-20-1** Micro #: 143287-77 Analyst: LZ **WHITE BASE ADHESIVE** **ROOM 306**	**BASE: NONE DETECTED** **ADHESIVE: NONE DETECTED** **COMPOUND: NONE DETECTED**	Matrix Type: **SYNTHETIC MATERIAL**

Technical Supervisor: for Gamini Ranatunga, Ph.D. 8/22/2010 Date Reported

Asbestos is quantified by calibrated visual estimation. Detection limit is material dependent. Detection of asbestos traces (much less than 1%) may not be reliable or reproducible by PLM. Weight % cannot be determined by PLM. Asbestos with diameter below ~1 µm may not be detected by PLM. Absence of asbestos in dust, debris, and some compact materials, including floor tiles, cannot be conclusively established by PLM, and should be confirmed by Transmission Electron Microscopy (TEM). The lower quantitation limit (reporting limit) of PLM estimation is 1%. The Cal-OSHA definition of asbestos-containing construction material is 0.1% asbestos; however, reliable determination of asbestos percent at this level cannot be done by PLM estimation; PLM Point Counting or TEM is recommended. Only dominant non-asbestos materials are indicated. Interferences may prevent detection of small asbestos fibers, and hinder determination of some optical properties. Sample heterogeneity is indicated by listing more than one distinct layer or material on the report. Layers are analyzed separately when feasible; if asbestos is detected, percentages are reported for individual layers. Interlayer contamination is possible among any layers in a sample. Composite asbestos percentages are applicable only to wallboard / joint compound systems; compositing is based on customers' descriptions of material as "joint compound". Customers are solely responsible for identification and description of bulk materials listed on field forms. Laboratory descriptions may differ from those given by customers. Quality Control (QC): all results have been determined to be within acceptance limits prior to reporting. Samples that were reanalyzed are denoted by two sets of analyst initials. Accreditation: NIST / NVLAP (Lab Code 101872-0). CA ELAP Certification #1037. EPA 1993 method is based on EPA Interim Method (1982), with improved analytical techniques. Unless otherwise stated herein, all samples were received in acceptable condition for analysis. This report must not be used to claim product endorsement by NIST or any U.S. Government agency. This report shall not be reproduced without the approval of Micro Analytical Laboratories, Inc., shall not be reproduced except in full, and pertains only to the samples analyzed. ND = NO ASBESTOS DETECTED.

* SPECIAL BILLING

143287

Bulk Sample Chain of Custody Form v5.3

Project Number / PO: 2062-003
Building Name: DCSS
Building Address: 393 13TH ST, OAKLAND
ADAM Site/Bldg ID#:

ACC Environmental Consultants, Inc.
___ Northern California: 7977 Capwell Drive, Suite 100 • Oakland, CA 94621
(510) 638-8400 Fax: (510) 638-8404
___ Southern California: 1545 Wilshire Blvd., Suite 500 • Los Angeles, CA 90017
(213) 353-1240 Fax: (213) 353-1244

Sampled By: Sample Date: QUANTITY

	Sample ID: HM#	Material Code	Sample Number	Material Description	Sample Location	Area	Results
1	BA	1	1	WHITE BASE ADHESIVE	RM 104	1ST FL	900 LF
2	↓	1	2	↓	RM 113		
3	↓		3	↓	RM 107	↓	
4	CT	2	1	2X4 CEILING TILE FISSURES	RM 108	1ST FL	1600 SF
5			2		RM 113		
6			3		RM 114	↓	
7	PL	3	1	PLASTER W/TEX, WALLS	RM 114	1ST FL	4900 SF
8	↓		2	CONCEALED BY DRYWALL	"		
9			3		"		
10			4		"		
11	↓		5	↓	"		
12	CA	6	1	YELLOW CARPET ADHESIVE	RM 104	1ST FL	10,250 SF
13			2	"	RM 107		
14	JC	7	1	DRYWALL + JC	RM 104		24,000 SF
15			2		RM 101		
16			3		RM 114		
17			4		RM 113		
18	↓		5		RM 107	↓	
19	CA	8	1	YELLOW + BROWN CARPET ADHES.	RM 117	RM 117	400 SF
20	FA	9	1	12"X12" GREY PEBBLETILE, BLACK AD	RM 113	RM 113	90 SF

Turn Around Time: ___ hr 12hr 24hr 48hr (5-day) Other: **Analyze to 1st Positive:** X Yes ___ No

Analysis: X PLM Standard ___ PLM Point Count (400) ___ PLM Point Count (1000) ___ TEM Qual ___ TEM Quant
___ Lead ___ PCBs (Aroclors only) ___ PCBs (Aroclors and Congeners) ___ Fungi (Direct Exam) ___ Bacteria
___ Particulate Characterization ___ Other:

Transfer Results Electronically? ___ Yes ___ No **email address:**

Attention: * **Alt. Fax Number:**

Special Instructions: * BILL TO JASON GARRISON
ALAMEDA COUNTY, TECHNICAL SERVICES
EMAIL TO CHRIS & JASON

Relinquished By:
Date/Time:
Courier Name:

For Lab Use

Received By:	VVM
Date/Time:	8/18/10 1527
Laboratory:	MAL
Sealed Condition:	(Yes) ___ No

Bulk Sample Chain of Custody Form v5.3

143287

ACC Environmental Consultants, Inc.

___ **Northern California:** 7977 Capwell Drive, Suite 100 • Oakland, CA 94621
(510) 638-8400 Fax: (510) 638-8404

___ **Southern California:** 1645 Wilshire Blvd., Suite 500 • Los Angeles, CA 90017
(213) 353-1240 Fax: (213) 353-1244

Project Number / PO: 2062-003

Building Name:

Building Address: 393 13TH ST, OAKLAND

ADAM Site/Bldg ID#:

Sampled By: Sample Date: QUANTITY

	Sample ID: HM#	Material Code	Sample Number	Material Description	Sample Location	Area	Results
21	BA	32	1	BROWN + WHITE BASE ADHES	RM 7	BASEMENT	500 LF
22	↓		2	"	RM 41		
23	FA	33	1	12X12 WHITE W/TAN, YELLOW AD	RM 7		960SF
24	PL	34	1	PLASTER	RM 6		4950 SF
25			2		RM 6		
26			3		RM 6		
27			4		RM 41		
28			5		RM 42		
29	↓		6	↓	RM 9	↓	
30	SU	35	1	STUCCO	RM 2		950 SF
31			2				
32	↓		3	↓	↓		
33	BA	36	1	WHITE BASE AD	OUTSIDE RM 2	↓	200 LF
34	SK	37	1	WHITE SINK UNDERCOAT	RM 14 - OUTSIDE		1 EACH
35	FA	38	1	12X12 TAN MARBLE, YELLOW AD	RM 15		25SF
36	CA	39	1	BROWN + YELLOW CARPET AD	RM 41		200 SF
37	FA	40	1	12X12 WHITE PEBBLE, BLACK AD	RM 9		100 SF

Turn Around Time: ___ hr 12hr 24hr 48hr (5-day) Other: **Analyze to 1st Positive:** ✓ Yes ___ No

Analysis: ✓ PLM Standard ___ PLM Point Count (400) ___ PLM Point Count (1000) ___ TEM Qual ___ TEM Quant

___ Lead ___ PCBs (Aroclors only) ___ PCBs (Aroclors and Congeners) ___ Fungi (Direct Exam) ___ Bacteria

___ Particulate Characterization ___ Other:

Transfer Results Electronically? ___ Yes ___ No **email address:**

Attention: **Alt. Fax Number:**

Special Instructions:

Relinquished By:

Date/Time:

Courier Name:

For Lab Use

Received By: MM

Date/Time: 8/18/10 1522

Laboratory: MAL

Sealed Condition: (Yes) No

Bulk Sample Chain of Custody Form v5.3

143287

Project Number / PO: 2062-003

Building Name:

Building Address: 393 13TH ST, OAKLAND

ADAM Site/Bldg ID#:

ACC Environmental Consultants, Inc.

___ Northern California: 7977 Capwell Drive, Suite 100 • Oakland, CA 94621
(510) 638-8400 Fax: (510) 638-8404

___ Southern California: 1545 Wilshire Blvd., Suite 500 • Los Angeles, CA 90017
(213) 353-1240 Fax: (213) 353-1244

A·C·C ENVIRONMENTAL CONSULTANTS

Sampled By: Sample Date:

	Sample ID: HM#	Material Code	Sample Number	Material Description	Sample Location	Area	Results: Quantity
38	BA	20	2	WHITE BASE AD	RM 324	2ND FL	
39	BA	21	1	" " "	RM 402	3RD FL	
40	FA	22	1	12X12 BEIGE W/ YELLOW AD	"	"	1,690 SF
41	↓		2	" "	"	"	~~2~~
42	FA	23	1	12X12 BLACK " "	"		20 SF
43	FA	24	1	12X12 PEACH " "			20 SF
44	FA	25	1	12X12 YELLOW			20 SF
45	JC	26	1	DRYWALL + JC	RM 404		520 SF
46	↓		2	"	"	↓	
47	MI	27	1	CONCRETE WALL	RM 406		4,800 SF
48	SK	28	1	WHITE SINK UNDERCOAT	RM 114	1ST FL	1 EACH
49	JC	29	1	DRYWALL + JC	OUTSIDE RM 7	BASEMENT	6,400 SF
50	↓		2		RM 7		
51			3		OUTSIDE RM 2		
52			4		RM 14		
53	↓		5		RM 9		
54	CT	30	1	2X4 CEILING TILE	OUTSIDE RM 7		1550 SF
55	WT	31	1	WALL TEXTURE ON CONCRETE	RM 7		950 SF
56	↓		2	↓	↓		
57			3				

Turn Around Time: ___ hr 12hr 24hr 48hr 5-day Other: **Analyze to 1st Positive:** X Yes ___ No

Analysis: X PLM Standard ___ PLM Point Count (400) ___ PLM Point Count (1000) ___ TEM Qual ___ TEM Quant

___ Lead ___ PCBs (Aroclors only) ___ PCBs (Aroclors and Congeners) ___ Fungi (Direct Exam) ___ Bacteria

___ Particulate Characterization ___ Other:

Transfer Results Electronically? ___ Yes ___ No **email address:**

Attention: **Alt. Fax Number:**

Special Instructions:

Relinquished By:

Date/Time:

Courier Name:

For Lab Use

Received By:	
Date/Time:	
Laboratory:	
Sealed Condition:	___ Yes ___ No

* SPECIAL BILLING 143287

Bulk Sample Chain of Custody Form v5.3

Project Number / PO: 2062-003
Building Name: DCSS
Building Address: 393 13TH ST, OAKLAND
ADAM Site/Bldg ID#:

ACC Environmental Consultants, Inc.
___ Northern California: 7977 Capwell Drive, Suite 100 • Oakland, CA 94621
(510) 638-8400 Fax: (510) 638-8404
___ Southern California: 1545 Wilshire Blvd., Suite 500 • Los Angeles, CA 90017
(213) 353-1240 Fax: (213) 353-1244

Sampled By: Sample Date: * SEE QUANTITY

	Sample ID: HM#	Material Code	Sample Number	Material Description	Sample Location	Area	Quantity
58	CT	10	1	2X4 CEILING TILE	RM 202	MEZZ	520 SF
59			2		RM 206		
60	JC	11	1	DRYWALL + JC	RM 206		1550 SF
61			2		RM 202		
62	CA	12	1	YELLOW CARPET AD	RM 206		520 SF
63	BA	13	1	WHITE BASE AD	RM 206		220 LF
64	FA	14	1	12X12 WHITE PEBBLE, BLACK AD	RM 202		190 SF
65	MF	15	1	RED FIRESTOP	RM 320	2ND FL	55F
66	CT	16	1	2X4 CEILING TILE	RM 306		1656 SF
67	↓		2		RM 320		
68	FA	17	1	12X12 GREY PEBBLE, BLACK AD	RM 320		140 SF
69	JC	18	1	DRYWALL + JC	RM 320		5,200 SF
70			2		RM 306		
71			3		OUT SIDE RM 305		
72			4		RM 303		
73			5		RM 307		
74			6		RM 324		
75	CA	19	1	YELLOW CARPET AD	RM 306		1600 SF
76			2		RM 324		
77	BA	20	1	WHITE BASE AD	RM 306		600 SF

Turn Around Time: ___hr 12hr 24hr 48hr 5-day Other: **Analyze to 1st Positive:** X Yes ___No

Analysis: X PLM Standard ___PLM Point Count (400) ___PLM Point Count (1000) ___TEM Qual ___TEM Quant
___ Lead ___ PCBs (Aroclors only) ___ PCBs (Aroclors and Congeners) ___ Fungi (Direct Exam) ___ Bacteria
___ Particulate Characterization ___ Other:

Transfer Results Electronically? ___Yes ___No **email address:**

Attention: **Alt. Fax Number:**

Special Instructions:

Relinquished By:
Date/Time:
Courier Name:

For Lab Use

Received By:	
Date/Time:	8/18/10 1522
Laboratory:	MRL
Sealed Condition:	(Yes) No

ENTERED
4/7/10 RF

04640

MICRO ANALYTICAL LABORATORIES, INC.

BULK ASBESTOS ANALYSIS - PLM (EPA/600/R-93/116, 1993)

1098
Dario Oakley
IHI Environmental
1260 45th Street, Suite L
Emeryville, CA 94608

PROJECT:
COA - 393 13TH STREET
OAKLAND, CA
09B-2074

Micro Log In **121729**
Total Samples 20
Date Sampled 02/24/2009
Date Received 02/24/2009
Date Analyzed 02/24/2009

SAMPLE IDENTIFICATION	ASBESTOS INFORMATION QUANTITY (AREA %) / TYPES / LAYERS / DISTINCT SAMPLES	DOMINANT OTHER MATERIALS
Client: **4640-090224-01** Micro: 121729-01 Analyst: DA **GYPSUM WALLBOARD SYSTEM** **1ST FLOOR - ENTRY THRESHOLD** **AT SOUTHEAST**	**GYPSUM BOARD: NONE DETECTED** **JOINT COMPOUND: NONE DETECTED** **PAINT: NONE DETECTED**	15 % CELLULOSE 3 % FIBROUS GLASS Matrix Type: MIXED CARBONATE - GYPSUM
Client: **4640-090224-02** Micro: 121729-02 Analyst: DA **GYPSUM WALLBOARD SYSTEM** **1ST FLOOR - SOUTH OFFICE** **AT SOUTHWEST CORNER**	**GYPSUM BOARD: NONE DETECTED** **JOINT COMPOUND: NONE DETECTED** **PAINT: NONE DETECTED** **TAPE: NONE DETECTED**	15 % CELLULOSE 3 % FIBROUS GLASS Matrix Type: MIXED CARBONATE - GYPSUM
Client: **4640-090224-03** Micro: 121729-03 Analyst: DA **COVE BASE MASTIC** **1ST FLOOR** **ENTRY THRESHOLD AT SOUTHEAST**	**MASTIC (OFF-WHITE): NONE DETECTED** **COMPOUND: NONE DETECTED**	10 % CELLULOSE Matrix Type: CARBONATE SYNTHETIC MATERIAL
Client: **4640-090224-04** Micro: 121729-04 Analyst: DA **COVE BASE MASTIC** **1ST FLOOR** **SOUTH OFFICE - SOUTH WALL**	**MASTIC (OFF-WHITE): NONE DETECTED** **PAINT: NONE DETECTED**	10 % CELLULOSE Matrix Type: CARBONATE SYNTHETIC MATERIAL
Client: **4640-090224-05** Micro: 121729-05 Analyst: DA **2' X 4' LAY IN ACOUSTICAL CEILING TILE** **MEZZANINE - CENTER - NORTH**	**CEILING TILE: NONE DETECTED** **COATING (WHITE): NONE DETECTED**	60 % CELLULOSE Matrix Type: GLASS FRAGMENTS

RECEIVED
County of Alameda
MAR 04 2009
GENERAL SERVICES AGENCY
TECHNICAL SERVICES DEPT

Technical Supervisor: 2/25/2009
Gamini Ranatunga, Ph.D. Date Reported

Asbestos is quantified by calibrated visual estimation. Detection limit is material dependent. Detection of asbestos traces (much less than 1%) may not be reliable or reproducible by PLM. Weight % cannot be determined by PLM. Asbestos with diameter below ~1 µm may not be detected by PLM. Absence of asbestos in dust, debris, and some compact materials, including floor tiles, cannot be conclusively established by PLM, and should be confirmed by Transmission Electron Microscopy (TEM). The lower quantitation limit (reporting limit) of PLM estimation is 1%. The Cal-OSHA definition of asbestos-containing construction material is 0.1% asbestos; however, reliable determination of asbestos percent at this level cannot be done by PLM estimation; PLM Point Counting or TEM is recommended. Only dominant non-asbestos materials are indicated. Interferences may prevent detection of small asbestos fibers, and hinder determination of some optical properties. Sample heterogeneity is indicated by listing more than one distinct layer or material on the report. Layers are analyzed separately when feasible; if asbestos is detected, percentages are reported for individual layers. Interlayer contamination is possible among any layers in a sample. Composite asbestos percentages are applicable only to wallboard / joint compound systems; compositing is based on customers' descriptions of material as "joint compound". Customers are solely responsible for identification and description of bulk materials listed on field forms. Laboratory descriptions may differ from those given by customers. Quality Control (QC) Codes: A1/A2 = results within acceptance limits; F = false positive or negative corrected, reanalysis within acceptance limits; M = Method error resolved (for trace amounts); R = Other, resolved after review. Accreditation: NIST / NVLAP (Lab Code 101872-0). CA ELAP Certification #1037. EPA 1993 method is based on EPA Interim Method (1982), with improved analytical techniques. Unless otherwise stated herein, all samples were received in acceptable condition for analysis. This report must not be used to claim product endorsement by NIST or any U.S. Government agency. This report shall not be reproduced without the approval of Micro Analytical Laboratories, Inc., shall not be reproduced except in full, and pertains only to the samples analyzed. ND = NO ASBESTOS DETECTED.

MICRO ANALYTICAL LABORATORIES, INC.

BULK ASBESTOS ANALYSIS - PLM (EPA/600/R-93/116, 1993)

1098
Dario Oakley
IHI Environmental
1260 45th Street, Suite L
Emeryville, CA 94608

PROJECT:
COA - 393 13TH STREET
OAKLAND, CA
09B-2074

Micro Log In **121729**
Total Samples 20
Date Sampled 02/24/2009
Date Received 02/24/2009
Date Analyzed 02/24/2009

SAMPLE IDENTIFICATION	ASBESTOS INFORMATION QUANTITY (AREA %) / TYPES / LAYERS / DISTINCT SAMPLES	DOMINANT OTHER MATERIALS
Client: **4640-090224-06** Micro: 121729-06 Analyst: DA **2' X 4' LAY IN ACOUSTICAL CEILING TILE MEZZANINE - CENTER - SOUTH**	**CEILING TILE: NONE DETECTED** **COATING (WHITE): NONE DETECTED**	60 % CELLULOSE Matrix Type: GLASS FRAGMENTS PERLITE
Client: **4640-090224-07** Micro: 121729-07 Analyst: DA **2' X 4' LAY IN ACOUSTICAL CEILING TILE MEZZANINE - EAST END**	**CEILING TILE: NONE DETECTED** **COATING (WHITE): NONE DETECTED** **PAINT: NONE DETECTED**	60 % CELLULOSE Matrix Type: GLASS FRAGMENTS PERLITE
Client: **4640-090224-08** Micro: 121729-08 Analyst: DA **WALLBOARD - SOFFITT MEZZANINE - CENTER - NORTH**	**NONE DETECTED**	15 % CELLULOSE 3 % FIBROUS GLASS Matrix Type: GYPSUM
Client: **4640-090224-09** Micro: 121729-09 Analyst: DA **WALLBOARD - SOFFITT MEZZANINE - CENTER - SOUTH**	**NONE DETECTED**	15 % CELLULOSE 3 % FIBROUS GLASS Matrix Type: GYPSUM
Client: **4640-090224-10** Micro: 121729-10 Analyst: DA GR **CARPET MASTIC - BROWN AND TAN MEZZANINE CENTER AT NORTH WALL**	**MASTIC (BROWN / TAN / YELLOW): NONE DETECTED** **COMPOUND: NONE DETECTED**	4 % CELLULOSE 2 % FIBROUS GLASS Matrix Type: CARBONATE SYNTHETIC MATERIAL QC: A2

Technical Supervisor: _____ 2/25/2009
Gamini Ranatunga, Ph.D. Date Reported

Asbestos is quantified by calibrated visual estimation. Detection limit is material dependent. Detection of asbestos traces (much less than 1%) may not be reliable or reproducible by PLM. Weight % cannot be determined by PLM. Asbestos with diameter below ~1 μm may not be detected by PLM. Absence of asbestos in dust, debris, and some compact materials, including floor tiles, cannot be conclusively established by PLM, and should be confirmed by Transmission Electron Microscopy (TEM). The lower quantitation limit (reporting limit) of PLM estimation is 1%. The Cal-OSHA definition of asbestos-containing construction material is 0.1% asbestos; however, reliable determination of asbestos percent at this level cannot be done by PLM estimation; PLM Point Counting or TEM is recommended. Only dominant non-asbestos materials are indicated. Interferences may prevent detection of small asbestos fibers, and hinder determination of some optical properties. Sample heterogeneity is indicated by listing more than one distinct layer or material on the report. Layers are analyzed separately when feasible; if asbestos is detected, percentages are reported for individual layers. Interlayer contamination is possible among any layers in a sample. Composite asbestos percentages are applicable only to wallboard / joint compound systems; compositing is based on customers' descriptions of material as "joint compound". Customers are solely responsible for identification and description of bulk materials listed on field forms. Laboratory descriptions may differ from those given by customers. Quality Control (QC) Codes: A1/A2 = results within acceptance limits; F = false positive or negative corrected, reanalysis within acceptance limits; M = Method error resolved (for trace amounts); R = Other, resolved after review. Accreditation: NIST / NVLAP (Lab Code 101872-0). CA ELAP Certification #1037. EPA 1993 method is based on EPA Interim Method (1982), with improved analytical techniques. Unless otherwise stated herein, all samples were received in acceptable condition for analysis. This report must not be used to claim product endorsement by NIST or any U.S. Government agency. This report shall not be reproduced without the approval of Micro Analytical Laboratories, Inc., shall not be reproduced except in full, and pertains only to the samples analyzed. ND = NO ASBESTOS DETECTED.

MICRO ANALYTICAL LABORATORIES, INC.

BULK ASBESTOS ANALYSIS - PLM (EPA/600/R-93/116, 1993)

1098
Dario Oakley
IHI Environmental
1260 45th Street, Suite L
Emeryville, CA 94608

PROJECT:
COA - 393 13TH STREET
OAKLAND, CA
09B-2074

Micro Log In **121729**
Total Samples 20
Date Sampled 02/24/2009
Date Received 02/24/2009
Date Analyzed 02/24/2009

SAMPLE IDENTIFICATION	ASBESTOS INFORMATION QUANTITY (AREA %) / TYPES / LAYERS / DISTINCT SAMPLES	DOMINANT OTHER MATERIALS
Client: **4640-090224-11** Micro: 121729-11 Analyst: DA **CARPET MASTIC - TAN** **MEZZANINE - EAST END**	**NONE DETECTED**	4 % CELLULOSE Matrix Type: CARBONATE SYNTHETIC MATERIAL
Client: **4640-090224-12** Micro: 121729-12 Analyst: DA **COVE BASE MASTIC** **MEZZANINE - CENTER - SOUTH WALL**	**MASTIC: NONE DETECTED** **PAINT: NONE DETECTED**	15 % CELLULOSE Matrix Type: CARBONATE SYNTHETIC MATERIAL
Client: **4640-090224-13** Micro: 121729-13 Analyst: DA **GYPSUM WALLBOARD SYSTEM** **MEZZANINE - NORTHWEST CORNER**	**GYPSUM BOARD: NONE DETECTED** **JOINT COMPOUND: NONE DETECTED** **PAINT: NONE DETECTED**	15 % CELLULOSE 2 % FIBROUS GLASS Matrix Type: MIXED CARBONATE - GYPSUM
Client: **4640-090224-14** Micro: 121729-14 Analyst: DA **GYPSUM WALLBOARD SYSTEM** **MEZZANINE - CENTER - SOUTH WALL**	**GYPSUM BOARD: NONE DETECTED** **JOINT COMPOUND: NONE DETECTED** **PAINT: NONE DETECTED**	15 % CELLULOSE 2 % FIBROUS GLASS Matrix Type: MIXED CARBONATE - GYPSUM
Client: **4640-090224-15** Micro: 121729-15 Analyst: DA **GYPSUM WALLBOARD SYSTEM** **MEZZANINE - NORTHEAST CORNER**	**GYPSUM BOARD: NONE DETECTED** **JOINT COMPOUND: NONE DETECTED** **PAINT: NONE DETECTED**	15 % CELLULOSE 2 % FIBROUS GLASS Matrix Type: MIXED CARBONATE - GYPSUM

Technical Supervisor: 2/25/2009
Gamini Ranatunga, Ph.D. Date Reported

Asbestos is quantified by calibrated visual estimation. Detection limit is material dependent. Detection of asbestos traces (much less than 1%) may not be reliable or reproducible by PLM. Weight % cannot be determined by PLM. Asbestos with diameter below ~1 µm may not be detected by PLM. Absence of asbestos in dust, debris, and some compact materials, including floor tiles, cannot be conclusively established by PLM, and should be confirmed by Transmission Electron Microscopy (TEM). The lower quantitation limit (reporting limit) of PLM estimation is 1%. The Cal-OSHA definition of asbestos-containing construction material is 0.1% asbestos; however, reliable determination of asbestos percent at this level cannot be done by PLM estimation; PLM Point Counting or TEM is recommended. Only dominant non-asbestos materials are indicated. Interferences may prevent detection of small asbestos fibers, and hinder determination of some optical properties. Sample heterogeneity is indicated by listing more than one distinct layer or material on the report. Layers are analyzed separately when feasible; if asbestos is detected, percentages are reported for individual layers. Interlayer contamination is possible among any layers in a sample. Composite asbestos percentages are applicable only to wallboard / joint compound systems; compositing is based on customers' descriptions of material as "joint compound". Customers are solely responsible for identification and description of bulk materials listed on field forms. Laboratory descriptions may differ from those given by customers. Quality Control (QC) Codes: A1/A2 = results within acceptance limits; F = false positive or negative corrected, reanalysis within acceptance limits; M = Method error resolved (for trace amounts); R = Other, resolved after review. Accreditation: NIST / NVLAP (Lab Code 101872-0). CA ELAP Certification #1037. EPA 1993 method is based on EPA Interim Method (1982), with improved analytical techniques. Unless otherwise stated herein, all samples were received in acceptable condition for analysis. This report must not be used to claim product endorsement by NIST or any U.S. Government agency. This report shall not be reproduced without the approval of Micro Analytical Laboratories, Inc., shall not be reproduced except in full, and pertains only to the samples analyzed. ND = NO ASBESTOS DETECTED.

MICRO ANALYTICAL LABORATORIES, INC.

BULK ASBESTOS ANALYSIS - PLM (EPA/600/R-93/116, 1993)

1098
Dario Oakley
IHI Environmental
1260 45th Street, Suite L
Emeryville, CA 94608

PROJECT:
COA - 393 13TH STREET
OAKLAND, CA
09B-2074

Micro Log In **121729**
Total Samples 20
Date Sampled 02/24/2009
Date Received 02/24/2009
Date Analyzed 02/24/2009

SAMPLE IDENTIFICATION	ASBESTOS INFORMATION QUANTITY (AREA %) / TYPES / LAYERS / DISTINCT SAMPLES	DOMINANT OTHER MATERIALS
Client: **4640-090224-16** Micro: 121729-16 Analyst: DA GR **CARPET MASTIC - TAN** **2ND FLOOR** **AT SOUTHEAST FLOOR MONUMENT**	**MASTIC (TAN): NONE DETECTED** LEVELING COMPOUND / RESIDUAL BLACK MASTIC: **4% CHRYSOTILE ASBESTOS**	4 % CELLULOSE Matrix Type: CARBONATE SYNTHETIC MATERIAL QC: A1
Client: **4640-090224-17** Micro: 121729-17 Analyst: DA **CARPET MASTIC - TAN** **2ND FLOOR** **AT NORTHWEST FLOOR MONUMENT**	**NONE DETECTED**	2 % CELLULOSE Matrix Type: SYNTHETIC MATERIAL
Client: **4640-090224-18** Micro: 121729-18 Analyst: DA **GYPSUM WALLBOARD SYSTEM** **2ND FLOOR - NORTHEAST - OFFICE** **NORTHWEST CORNER**	**GYPSUM BOARD: NONE DETECTED** **JOINT COMPOUND: NONE DETECTED** **PAINT: NONE DETECTED**	15 % CELLULOSE 3 % FIBROUS GLASS Matrix Type: MIXED CARBONATE - GYPSUM
Client: **4640-090224-19** Micro: 121729-19 Analyst: DA **2' X 4' LAY IN ACOUSTICAL CEILING TILE** **2ND FLOOR - ABOVE SOUTHWEST** **FLOOR MONUMENT**	**CEILING TILE: NONE DETECTED** **COATING (WHITE): NONE DETECTED**	60 % CELLULOSE 5 % FIBROUS GLASS Matrix Type: GLASS FRAGMENTS PERLITE
Client: **4640-090224-20** Micro: 121729-20 Analyst: DA **2' X 4' LAY IN ACOUSTICAL CEILING TILE** **2ND FLOOR - ABOVE NORTHWEST** **FLOOR MONUMENT**	**CEILING TILE: NONE DETECTED** **COATING (WHITE): NONE DETECTED**	60 % CELLULOSE 5 % FIBROUS GLASS Matrix Type: GLASS FRAGMENTS PERLITE

Technical Supervisor: Gamini Ranatunga, Ph.D. 2/25/2009 Date Reported

Asbestos is quantified by calibrated visual estimation. Detection limit is material dependent. Detection of asbestos traces (much less than 1%) may not be reliable or reproducible by PLM. Weight % cannot be determined by PLM. Asbestos with diameter below ~1 µm may not be detected by PLM. Absence of asbestos in dust, debris, and some compact materials, including floor tiles, cannot be conclusively established by PLM, and should be confirmed by Transmission Electron Microscopy (TEM). The lower quantitation limit (reporting limit) of PLM estimation is 1%. The Cal-OSHA definition of asbestos-containing construction material is 0.1% asbestos; however, reliable determination of asbestos percent at this level cannot be done by PLM estimation; PLM Point Counting or TEM is recommended. Only dominant non-asbestos materials are indicated. Interferences may prevent detection of small asbestos fibers, and hinder determination of some optical properties. Sample heterogeneity is indicated by listing more than one distinct layer or material on the report. Layers are analyzed separately when feasible; if asbestos is detected, percentages are reported for individual layers. Interlayer contamination is possible among any layers in a sample. Composite asbestos percentages are applicable only to wallboard / joint compound systems; compositing is based on customers' descriptions of material as "joint compound". Customers are solely responsible for identification and description of bulk materials listed on field forms. Laboratory descriptions may differ from those given by customers. Quality Control (QC) Codes: A1/A2 = results within acceptance limits; F = false positive or negative corrected, reanalysis within acceptance limits; M = Method error resolved (for trace amounts); R = Other, resolved after review. Accreditation: NIST / NVLAP (Lab Code 101872-0). CA ELAP Certification #1037. EPA 1993 method is based on EPA Interim Method (1982), with improved analytical techniques. Unless otherwise stated herein, all samples were received in acceptable condition for analysis. This report must not be used to claim product endorsement by NIST or any U.S. Government agency. This report shall not be reproduced without the approval of Micro Analytical Laboratories, Inc., shall not be reproduced except in full, and pertains only to the samples analyzed. ND = NO ASBESTOS DETECTED.

CLEAR FORM | SAVE FORM | E-MAIL

Client ID #

MICRO ANALYTICAL LABORATORIES, INC.

5900 Hollis St., Suite M, Emeryville, CA 94608
(510) 653-0824 - (510) 653-1361 - FAX

Log in # 14729

Name / Client / Address:
Dario Oakley
IHI Environmental
1260 45th Street
Emeryville, CA 94608

Tel. (510) 923-1661
Fax (510) 923-1468
E-mail oakley @ihi-env.com

Project
COA 393 13th St,
Oakland [redacted]

Job No. 098-2074

Asbestos (TEM)
Asbestos PLM
Lead Only
Metals (Specify)
Mold, Non-Viable
Other (Specify)

Page 1 of 2

Number of Samples: 20
Turn-Around Time: 24 hour

Micro ID # (For Lab Use Only)	Client Sample ID#	Description / Location	Date Sampled	Time Sampled Start / Stop / Total Minutes	Average LPM	Total Liters	Filter Pore Size
1	4640-090224-01	Gypsum Wallboard System / 1st Floor, Entry Threshold at SE	2/24/09	: :			
2	-02	↓ / 1st Floor, South Office at SW Corner	↓	: :			
3	-03	Cove Base Mastic / 1st Floor, Entry Threshold at SE		: :			
4	-04	↓ / 1st Floor, South Office, South Wall		: :			
5	-05	2' x 4' Lay-in Acoustical Ceiling Tile / Mezzanine, Center, North		: :			
6	-06	/ Mezzanine, Center, South		: :			
7	-07	↓ / Mezzanine, East End		: :			
8	-08	Wallboard [redacted] / Mezzanine, Center, North		: :			
9	-09	↓ / Mezzanine, Center, South		: :			
10	↓ -10	Carpet Mastic, Brown & Tan / Mezzanine, Center at North Wall	↓	: :			

Instructions / Comments: ☐ Fax ☒ E-mail To:

Sample Return: YES ☐ NO ☐ If "YES" is checked, samples will be returned to the client or archived at Micro Analytical if required.
If "NO" is checked, solid samples may be disposed of within three months (one week for liquid samples, lab suspensions, and digestates).

Sampler's Signature / Name: Ian Dirk

Note to Lab: If any samples are not acceptable, record reasons for rejection.

Relinquished By: 2/24/09 — Date / Time — Drop Box / Courier — Received By: 2.24.09 11:5 — Date / Time

Relinquished By — Date/Time — Received By — Date / Time

Page ☐ of ☐

CLEAR FORM | SAVE FORM | E-MAIL

Client ID #

MICRO ANALYTICAL LABORATORIES, INC.

5900 Hollis St., Suite M, Emeryville, CA 94608
(510) 653-0824 - (510) 653-1361 - FAX

Log in # 12729

Name / Client / Address:
Dario Oakley
IHI Environmental
1260 45th Street
Emeryville, CA 94608

Tel. (510) 923-1661
Fax (510) 923-1468
E-mail oakley @ihi-env.com

Project
COA 393 13th St,
Oakland

Job No. 09B-2074

Asbestos (TEM)
Asbestos PLM
Lead Only
Metals (Specify)
Mold, Non-Viable
Other (Specify)

Page 2 of 2

Number of Samples: 20
Turn-Around Time: 24 hour

Micro ID # (For Lab Use Only)	Client Sample ID#	Description	Date Sampled	Time Sampled Start / Stop / Total Minutes	Average LPM	Total Liters	Filter Pore Size
11	46040-090224-11	Carpet Mastic, Tan / Mezzanine, East End	2/24/09	: :			
12	-12	Cove Base Mastic / Mezzanine, Center, South Wall		: :			
13	-13	Gypsum Wallboard System / Mezzanine, NW Corner		: :			
14	-14	↓ / Mezzanine, Center, South Wall		: :			
15	-15	↓ / Mezzanine, NE Corner		: :			
16	-16	Carpet Mastic, Tan / 2nd Floor, at SE Floor Monument		: :			
17	-17	↓ / 2nd Floor, at NW Floor Monument		: :			
18	-18	Gypsum Wallboard System / 2nd Floor, NE office, NW Corner		: :			
19	-19	2' x 4' Lay-In Acoustical Ceiling Tile / 2nd Floor, above SW Floor Monument		: :			
20	-20	↓ / 2nd Floor, above NW Floor Monument		: :			

Instructions / Comments: ☐ Fax ☒ E-mail To:

Sample Return: YES ☐ NO ☐ If "YES" is checked, samples will be returned to the client or archived at Micro Analytical if required.
If "NO" is checked, solid samples may be disposed of within three months (one week for liquid samples, lab suspensions, and digestates).

Sampler's Signature / Name: Jan Dirk

Note to Lab: If any samples are not acceptable, record reasons for rejection.

Relinquished By: Jan Dirk — Date / Time: 2/24/09 — Drop Box / Courier — Received By: [illegible] — Date / Time: 2-24-09 11:51

Relinquished By — Date/Time — Received By — Date / Time

Page ☐ of ☐

04640

MICRO ANALYTICAL LABORATORIES, INC.

BULK ASBESTOS ANALYSIS - PLM (EPA/600/R-93/116, 1993)

1033

County of Alameda - GSA
Engineering & Environmental Management Department
1401 Lakeside Drive, Suite 1115
Oakland, CA 94612

PROJECT:
393 13TH STREET
BUILDING 04640

RECEIVED
MAY 25 2005
COUNTY OF ALAMEDA-GSA
Technical Services
Department

Micro Log In **70804**
Total Samples 9
Date Sampled 05/20/2005
Date Received 05/20/2005
Date Analyzed 05/20/2005

SAMPLE INFORMATION	ASBESTOS INFORMATION QUANTITY (AREA %) / TYPES / LAYERS / DISTINCT SAMPLES	DOMINANT OTHER MATERIALS
Client: **04640-050520-01** Micro: 70804-01 Analyst: BK **ROOF MASTIC AT FLASHING** **BLACK COLOR - ROOF** **UPPER ROOF # 1**	**FIBERGLASS FELT: NONE DETECTED** **SYNTHETIC FIBER FELT: NONE DETECTED** **GRAY MASTIC: 5% CHRYSOTILE**	5 % FIBROUS GLASS 5 % SYNTHETIC FIBERS TAR CARBONATE SYNTHETIC MATERIAL
Client: **04640-050520-02** Micro: 70804-02 Analyst: BK **ROLL ROOFING** **BROWN / BLACK COLOR ROOF** **UPPER ROOF # 1**	**FIBERGLASS FELT: NONE DETECTED** **SYNTHETIC FIBER FELT: NONE DETECTED**	5 % FIBROUS GLASS 5 % SYNTHETIC FIBERS TAR CARBONATE SYNTHETIC MATERIAL
Client: **04640-050520-03** Micro: 70804-03 Analyst: BK **CAULK** **GREY COLOR ROOF** **UPPER ROOF #2**	**20% CHRYSOTILE**	TAR ROCK FRAGMENTS
Client: **04640-050520-04** Micro: 70804-04 Analyst: BK **ROLLED ROOF** **BROWN & BLACK COLOR ROOF** **UPPER ROOF # 2**	**FIBERGLASS FELT: NONE DETECTED** **SYNTHETIC FIBER FELT: NONE DETECTED** **FIBROUS TAR AT BOTTOM: 30% CHRYSOTILE**	5 % FIBROUS GLASS 5 % SYNTHETIC FIBERS TAR CARBONATE SYNTHETIC MATERIAL
Client: **04640-050520-05** Micro: 70804-05 Analyst: BK AF **ROOF PATCH** **ROOF**	**FIBERGLASS FELT: NONE DETECTED** **SYNTHETIC FIBER FELT: NONE DETECTED** **BROWNISH TAR: NONE DETECTED**	5 % FIBROUS GLASS 5 % SYNTHETIC FIBERS TAR CARBONATE SYNTHETIC MATERIAL QC*A2

Technical Supervisor: _____ 5/22/2005
Baojia Ke, Ph. D. Date Reported

NOTES: Weight % cannot be determined by PLM estimation or point counts. Asbestos fibers with diameter below ~1 µm may not be detected by PLM. The absence of asbestos in dust or debris (including wipe or microvacuum), and in some compact materials, including floor tiles, cannot be conclusively established by PLM, and should be confirmed by Transmission Electron Microscopy (TEM). Only dominant non-asbestos materials are indicated. This report must not be interpreted as a conclusive identification of non-asbestos (fibrous or not). Preparation (all samples): grinding, milling; teasing bundles apart; drying, if needed, by hotplate. Acid dissolution, ashing, or other matrix reduction techniques may be applied to some samples; residue asbestos % is corrected for amount of matrix removed. Various sample interferences may prevent detection of small asbestos fibers, and hinder determination of some optical properties. Notes are made if point counting is used; otherwise, asbestos is quantified by calibrated visual estimation. Detection limit is material dependent. Detection of asbestos traces (<<1%) may not be reliable or reproducible by PLM. Lower quantitation limit (reporting limit) of PLM estimation is 1%. The 95% UCL and LCL (Upper and Lower Confidence Limits) represent the highest and lowest expected concentrations for an asbestos point count, based on reported concentration and Poisson statistics. The Cal-OSHA definition of asbestos-containing construction material is 0.1% asbestos by weight; however, reliable determination of asbestos weight percent at this level cannot be done by PLM, and TEM is recommended. Layers of heterogeneous samples are analyzed separately; asbestos percentages are reported for individual layers. Interlayer contamination is possible among any layers in a sample. Composite asbestos percentages on multilayered samples are applicable only to layered wall systems (wallboard, joint compound, and related materials); compositing is based on clients' descriptions of a material as "joint compound". Clients are solely responsible for identification and description of bulk materials listed on field forms. Laboratory sample descriptions may differ from descriptions given by the client. "Quality Control (QC) Codes: A1/A2 = results within acceptance limits; B = no asbestos detected in lab blank (SRM 1866a Fibrous Glass or equivalent); R = all materials confirmed after multiple result resolutions. NIST / NVLAP Accreditation Lab Code: #101872-0. California ELAP Certification #1037. EPA test method is based on the EPA Interim Method (1982), with several improvements in analytical techniques. Unless otherwise stated in this report, all samples were received in acceptable condition for analysis. This report must not be used to claim product endorsement by NIST or any U.S. Government agency. This report pertains only to the samples tested and must not be reproduced except in full, with approval of Micro Analytical Laboratories.

MICRO ANALYTICAL LABORATORIES, INC.

BULK ASBESTOS ANALYSIS - PLM (EPA/600/R-93/116, 1993)

1033

County of Alameda - GSA
Engineering & Environmental Management Department
1401 Lakeside Drive, Suite 1115
Oakland, CA 94612

PROJECT:
393 13TH STREET
BUILDING 04640

Micro Log In **70804**
Total Samples 9
Date Sampled 05/20/2005
Date Received 05/20/2005
Date Analyzed 05/20/2005

SAMPLE INFORMATION	ASBESTOS INFORMATION QUANTITY (AREA %) / TYPES / LAYERS / DISTINCT SAMPLES	DOMINANT OTHER MATERIALS
Client: **04640-050520-06** Micro: 70804-06 Analyst: BK **ROLL ROOF** **BROWN / BLACK COLOR ROOF** **MAIN UPPER ROOF**	**FIBERGLASS FELT: NONE DETECTED** **SYNTHETIC FIBER FELT WITH GRAVEL: NONE DETECTED**	5 % FIBROUS GLASS 5 % SYNTHETIC FIBERS TAR CARBONATE SYNTHETIC MATERIAL ROCK FRAGMENTS
Client: **04640-050520-07** Micro: 70804-07 Analyst: BK **MASTIC ON GUTTER** **BROWN COLOR**	**MASTIC: 5% CHRYSOTILE** **PAINT: NONE DETECTED**	TAR CARBONATE OPAQUES
Client: **04640-050520-08** Micro: 70804-08 Analyst: BK **ROLLED ROOF** **BROWN / BLACK COLOR**	**FIBERGLASS FELT: NONE DETECTED** **SYNTHETIC FIBER FELT WITH GRAVEL: NONE DETECTED**	5 % FIBROUS GLASS 5 % SYNTHETIC FIBERS TAR CARBONATE SYNTHETIC MATERIAL ROCK FRAGMENTS
Client: **04640-050520-09** Micro: 70804-09 Analyst: BK **MASTIC / SEALANT AT FLASHING** **BROWN / BLACK COLOR** **UPPER ROOF # 4**	**5% CHRYSOTILE**	TAR CARBONATE SYNTHETIC MATERIAL

Technical Supervisor: _____ 5/20/2005
Baojia Ke, Ph. D. Date Reported

NOTES: Weight % cannot be determined by PLM estimation or point counts. Asbestos fibers with diameter below ~1 µm may not be detected by PLM. The absence of asbestos in dust or debris (including wipe or microvacuum), and in some compact materials, including floor tiles, cannot be conclusively established by PLM, and should be confirmed by Transmission Electron Microscopy (TEM). Only dominant non-asbestos materials are indicated. This report must not be interpreted as a conclusive identification of non-asbestos (fibrous or not). Preparation (all samples): grinding, milling; teasing bundles apart; drying, if needed, by hotplate. Acid dissolution, ashing, or other matrix reduction techniques may be applied to some samples; residue asbestos % is corrected for amount of matrix removed. Various sample interferences may prevent detection of small asbestos fibers, and hinder determination of some optical properties. Notes are made if point counting is used; otherwise, asbestos is quantified by calibrated visual estimation. Detection limit is material dependent. Detection of asbestos traces (<<1%) may not be reliable or reproducible by PLM. Lower quantitation limit (reporting limit) of PLM estimation is 1%. The 95% UCL and LCL (Upper and Lower Confidence Limits) represent the highest and lowest expected concentrations for an asbestos point count, based on reported concentration and Poisson statistics. The Cal-OSHA definition of asbestos-containing construction material is 0.1% asbestos by weight; however, reliable determination of asbestos weight percent at this level cannot be done by PLM, and TEM is recommended. Layers of heterogeneous samples are analyzed separately; asbestos percentages are reported for individual layers. Interlayer contamination is possible among any layers in a sample. Composite asbestos percentages on multilayered samples are applicable only to layered wall systems (wallboard, joint compound, and related materials); compositing is based on clients' descriptions of a material as "joint compound". Clients are solely responsible for identification and description of bulk materials listed on field forms. Laboratory sample descriptions may differ from descriptions given by the client. "Quality Control (QC) Codes: A1/A2 = results Within acceptance limits; B = no asbestos detected in lab blank (SRM 1866a Fibrous Glass or equivalent); R = all materials confirmed after multiple result resolutions. NIST / NVLAP Accreditation Lab Code: #101872-0. California ELAP Certification #1037. EPA test method is based on the EPA Interim Method (1982), with several improvements in analytical techniques. Unless otherwise stated in this report, all samples were received in acceptable condition for analysis. This report must not be used to claim product endorsement by NIST or any U.S. Government agency. This report pertains only to the samples tested and must not be reproduced except in full, with approval of Micro Analytical Laboratories.

COUNTY OF ALAMEDA, GSA-TSD
1401 LAKESIDE DRIVE, RM. 1115
OAKLAND, CA 94612

Contact: Jason Garrison
Analysis Type: PLM
TAT: P hr 12hr ~~24hr~~ 48hr >48hr

7084

FACILITY NAME		BLDG. NO.	04640
FACILITY ADDRESS	393 13th Street		
SAMPLE TAKEN BY	Jason Garrison	DATE	5/20/05

SAMPLE NUMBER (Bldg #-yymmdd-#)*	04640-050520-01	MATERIAL TYPE		roof mastic at flashing	
(a1) MATERIAL DESC.	SIZE		COLOR	black	
SAMPLE LOCATION	FLOOR roof	ROOM NO		AREA	upper roof #1

SAMPLE NUMBER	04640-050520-02	MATERIAL TYPE		~~Fiberglass~~ roof roll roofing	
(a2) MATERIAL DESC.	SIZE		COLOR	brown/black	
SAMPLE LOCATION	FLOOR roof	ROOM NO		AREA	upper roof #1

SAMPLE NUMBER	04640-050520-03	MATERIAL TYPE		caulk	
(M) MATERIAL DESC.	SIZE		COLOR	grey	
SAMPLE LOCATION	FLOOR roof	ROOM NO		AREA	upper roof #2

RELINQUISHED BY	Jason T. Garrison	DATE/TIME	5/20/05
RECEIVED BY	[illegible]	DATE/TIME	5.20.05

16:01

Distribution:
1) Lab
2) GSA-TSD QIC 26023
3) Retain One Copy for your files

Lab must submit this form and test results to GSA-TSD,. 1401 Lakeside Dr., 11th Floor Oakland, CA 94612, attn: Jason Garrison, Before invoice will be paid.

* - Sample numbers are generated by Building Number followed by the date, year, month, day, and then sample number. For example, a sample collected from Building 1901 on April 30, 1999, would be numbered 1901-990430-01. Please adhere to this numbering method. For samples other than asbestos, insert a sample type indicator after the date and before the sample number. For example 1901-990430-Pb-01, would be a lead sample.

COUNTY OF ALAMEDA, GSA-TSD
1401 LAKESIDE DRIVE, RM. 1115
OAKLAND, CA 94612

Contact
Analysis Type
TAT 0804 hr 12hr (24hr) 48hr >48hr

FACILITY NAME		BLDG. NO.	
FACILITY ADDRESS	See page 1		
SAMPLE TAKEN BY		DATE	

SAMPLE NUMBER (Bldg.# - yymmdd - #)*	04640-050520-04		MATERIAL TYPE	rolled roof	
MATERIAL DESC.	SIZE		COLOR	brown + black	
SAMPLE LOCATION	FLOOR	roof	ROOM NO	AREA	upper roof #2

SAMPLE NUMBER	04640-050520-05		MATERIAL TYPE	roof patch	
MATERIAL DESC.	SIZE		COLOR		
SAMPLE LOCATION	FLOOR	roof	ROOM NO	AREA	

SAMPLE NUMBER	04640-050520-06		MATERIAL TYPE	roll roof	
MATERIAL DESC.	SIZE		COLOR	brown/black	
SAMPLE LOCATION	FLOOR	roof	ROOM NO	AREA	main upper roof

RELINQUISHED BY	Jason B. Garrison	DATE/TIME	5/20/05
RECEIVED BY	[illegible]	DATE/TIME	5.20.05 16:0

Distribution:
1) Lab
2) GSA-TSD QIC 26023
3) Retain One Copy for your files

Lab must submit this form and test results to GSA-TSD,. 1401 Lakeside Dr., 11th Floor Oakland, CA 94612, attn: Jason Garrison, Before invoice will be paid.

* - Sample numbers are generated by Building Number followed by the date, year, month, day, and then sample number. For example, a sample collected from Building 1901 on April 30, 1999, would be numbered 1901-990430-01. Please adhere to this numbering method. For samples other than asbestos, insert a sample type indicator after the date and before the sample number. For example 1901-990430-Pb-01, would be a lead sample.

COUNTY OF ALAMEDA, GSA-TSD
1401 LAKESIDE DRIVE, RM. 1115
OAKLAND, CA 94612

Contact: Jason Garrison
Analysis Type: PLM
TAT: ___hr 12hr (24hr) 48hr >48hr

FACILITY NAME		BLDG. NO.	
FACILITY ADDRESS	See Page 1		
SAMPLE TAKEN BY		DATE	

SAMPLE NUMBER (Bldg # - yymmdd - #)*	04640-050520-07		MATERIAL TYPE		mastic on gutter
MATERIAL DESC.	SIZE		COLOR		black brown
SAMPLE LOCATION	FLOOR		ROOM NO		AREA

(07)

SAMPLE NUMBER	04640-050520-08		MATERIAL TYPE		built up roof
MATERIAL DESC.	SIZE		COLOR		brown/black
SAMPLE LOCATION	FLOOR		ROOM NO		AREA

(08)

SAMPLE NUMBER	04640-050520-09		MATERIAL TYPE		mastic/sealant at flashing
MATERIAL DESC.	SIZE		COLOR		brown/black
SAMPLE LOCATION	FLOOR		ROOM NO		AREA upper roof #4

(09)

RELINQUISHED BY	Jason L. Garrison	DATE/TIME	5/20/05
RECEIVED BY	fhmg	DATE/TIME	5.20.05 16:01

Distribution:
1) Lab
2) GSA-TSD QIC 26023
3) Retain One Copy for your files

Lab must submit this form and test results to GSA-TSD,. 1401 Lakeside Dr., 11th Floor Oakland, CA 94612, attn: Jason Garrison, Before invoice will be paid.

* - Sample numbers are generated by Building Number followed by the date, year, month, day, and then sample number. For example, a sample collected from Building 1901 on April 30,. 1999, would be numbered 1901-990430-01. Please adhere to this numbering method. For samples other than asbestos, insert a sample type indicator after the date and before the sample number. For example 1901-990430-Pb-01, would be a lead sample.

04640

MICRO ANALYTICAL LABORATORIES, INC.

BULK ASBESTOS ANALYSIS - PLM (EPA/600/R-93/116, 1993)

1033

PROJECT:
393 13TH STREET

Micro Log In **65949**
Total Samples 4
Date Sampled 12/01/2004
Date Received 12/01/2004
Date Analyzed 12/01/2004

County of Alameda - GSA
Engineering & Environmental Management Department
1401 Lakeside Drive, Suite 1115
Oakland, CA 94612

SAMPLE INFORMATION	ASBESTOS INFORMATION QUANTITY (AREA %) / TYPES / LAYERS / DISTINCT SAMPLES	DOMINANT OTHER MATERIALS
Client: 041201-01A Micro: 65949-01 Analyst: GR STUCCO GREY ROOF	STUCCO: NONE DETECTED BEIGE SKIM / PAINT: 2% CHRYSOTILE	CARBONATE ROCK FRAGMENTS SYNTHETIC MATERIAL
Client: 041201-02A Micro: 65949-02 Analyst: GR STUCCO GREY ROOF	STUCCO: NONE DETECTED BROWN SKIM / PAINT: 2% CHRYSOTILE	CARBONATE ROCK FRAGMENTS SYNTHETIC MATERIAL
Client: 041201-03A Micro: 65949-03 Analyst: GR TAPE / TEXTURE GREY ROOF	TAPE: NONE DETECTED TEXTURE / PAINT: 3% CHRYSOTILE	20 % FIBROUS GLASS ROCK FRAGMENTS SYNTHETIC MATERIAL
Client: 041201-04A Micro: 65949-04 Analyst: GR EXTERIOR STUCCO GREY UPPER ROOF	NONE DETECTED	CARBONATE ROCK FRAGMENTS SYNTHETIC MATERIAL

Technical Supervisor: _____ 12/1/2004
Baojia Ke, Ph. D. Date Reported

NOTES: Weight % cannot be determined by PLM estimation or point counts. Asbestos fibers with diameter below ~1 µm may not be detected by PLM. The absence of asbestos in dust or debris (including wipe or microvacuum), and in some compact materials, including floor tiles, cannot be conclusively established by PLM, and should be confirmed by Transmission Electron Microscopy (TEM). Only dominant non-asbestos materials are indicated. This report must not be interpreted as a conclusive identification of non-asbestos (fibrous or not). Preparation (all samples): grinding, milling; teasing bundles apart; drying, if needed, by hotplate. Acid dissolution, ashing, or other matrix reduction techniques may be applied to some samples; residue asbestos % is corrected for amount of matrix removed. Various sample interferences may prevent detection of small asbestos fibers, and hinder determination of some optical properties. Notes are made if point counting is used; otherwise, asbestos is quantified by calibrated visual estimation. Detection limit is material dependent. Detection of asbestos traces (<<1%) may not be reliable or reproducible by PLM. Lower quantitation limit (reporting limit) of PLM estimation is 1%. The 95% UCL and LCL (Upper and Lower Confidence Limits) represent the highest and lowest expected concentrations for an asbestos point count, based on reported concentration and Poisson statistics. The Cal-OSHA definition of asbestos-containing construction material is 0.1% asbestos by weight; however, reliable determination of asbestos weight percent at this level cannot be done by PLM, and TEM is recommended. Layers of heterogeneous samples are analyzed separately; asbestos percentages are reported for individual layers. Interlayer contamination is possible among any layers in a sample. Composite asbestos percentages on multilayered samples are applicable only to layered wall systems (wallboard, joint compound, and related materials); compositing is based on clients' descriptions of a material as "joint compound". Clients are solely responsible for identification and description of bulk materials listed on field forms. Laboratory sample descriptions may differ from descriptions given by the client. *Quality Control (QC) Codes: A = results confirmed (within acceptance limits); B = no asbestos detected in lab blank (SRM 1866a Fibrous Glass or equivalent); R = all materials confirmed after multiple result resolutions. NIST / NVLAP Accreditation Lab Code: #101872-0. California ELAP Certification #1037. EPA test method is based on the EPA Interim Method (1982), with several improvements in analytical techniques. This report must not be used to claim product endorsement by NIST or any U.S. Government agency. This report must not be reproduced except in full, with approval of Micro Analytical Laboratories.

COUNTY OF ALAMEDA, GSA-TSD
1401 LAKESIDE DRIVE, RM. 1115
OAKLAND, CA 94612

Contact: Jason Garrison
Analysis Type: PLM
TAT: 65949 hr 12hr ~~24hr~~ 48hr >48hr

FACILITY NAME	393 13th Street	BLDG. NO.	
FACILITY ADDRESS			
SAMPLE TAKEN BY	Jason Garrison	DATE	12/1/04

SAMPLE NUMBER (Bldg # - yymmdd - #)*	041201-01A	MATERIAL TYPE	Stucco		
C1 MATERIAL DESC.	SIZE		COLOR	grey	
SAMPLE LOCATION	FLOOR		ROOM NO.	AREA	roof

SAMPLE NUMBER	041201-02A	MATERIAL TYPE	stucco		
02 MATERIAL DESC.	SIZE		COLOR	grey	
SAMPLE LOCATION	FLOOR		ROOM NO.	AREA	roof

SAMPLE NUMBER	041201-03A	MATERIAL TYPE	tape/texture		
03 MATERIAL DESC.	SIZE		COLOR	green	
SAMPLE LOCATION	FLOOR		ROOM NO.	AREA	roof

RELINQUISHED BY	Jason B. Garrison	DATE/TIME	12/1/04
RECEIVED BY		DATE/TIME	12/1 14:29

Distribution:
1) Lab
2) GSA-TSD QIC 26023
3) Retain One Copy for your files

Lab must submit this form and test results to GSA-TSD,. 1401 Lakeside Dr., 11th Floor Oakland, CA 94612, attn: Jason Garrison, Before invoice will be paid.

* - Sample numbers are generated by Building Number followed by the date, year, month, day, and then sample number. For example, a sample collected from Building 1901 on April 30, 1999, would be numbered 1901-990430-01. Please adhere to this numbering method. For samples other than asbestos, insert a sample type indicator after the date and before the sample number. For example 1901-990430-Pb-01, would be a lead sample.

COUNTY OF ALAMED GSA-TSD
1401 LAKESIDE DRIVE, RM. 1115
OAKLAND, CA 94612

Contact Jason Garrison
Analysis Type PLM
TAT 1hr 12hr 24hr 48hr >48hr

65949

FACILITY NAME		BLDG. NO.	
FACILITY ADDRESS	See Page 1		
SAMPLE TAKEN BY		DATE	

SAMPLE NUMBER (Bldg # - yymmdd - #)*	041201-04A	MATERIAL TYPE	exterior stucco		
MATERIAL DESC.	SIZE		COLOR	tan grey	
SAMPLE LOCATION	FLOOR		ROOM NO	AREA	upper roof

SAMPLE NUMBER		MATERIAL TYPE			
MATERIAL DESC.	SIZE		COLOR		
SAMPLE LOCATION	FLOOR		ROOM NO	AREA	

SAMPLE NUMBER		MATERIAL TYPE			
MATERIAL DESC.	SIZE		COLOR		
SAMPLE LOCATION	FLOOR		ROOM NO	AREA	

RELINQUISHED BY	Jason B. Garrison	DATE/TIME	12/1/04
RECEIVED BY		DATE/TIME	12.1.04 14:29

Distribution:
1) Lab
2) GSA-TSD QIC 26023
3) Retain One Copy for your files

Lab must submit this form and test results to GSA-TSD,. 1401 Lakeside Dr., 11th Floor Oakland, CA 94612, attn: Jason Garrison, Before invoice will be paid.

* - Sample numbers are generated by Building Number followed by the date, year, month, day, and then sample number. For example, a sample collected from Building 1901 on April 30, 1999, would be numbered 1901-990430-01. Please adhere to this numbering method. For samples other than asbestos, insert a sample type indicator after the date and before the sample number. For example 1901-990430-Pb-01, would be a lead sample.

0460

Hygienetics Environmental

Hygienetics Environmental Services, Inc.

1210 Marina Village Pkwy, #104
Alameda, CA 94501

Phone: (510) 749-1003
Fax: (510) 749-1069

March 21, 2001

RECEIVED
MAR 22 2001
BY:

Mr. David Speer
Real Estate Projects Manager
General Services Agency
1401 Lakeside Drive, 10thFloor
Oakland, California 94612-4305

RE: Asbestos Sampling
Debris at Bottom of Southeast Airshaft
393 13th Street
Oakland, California

Dear Mr. Speer:

On March 201, 2001 Hygienetics Environmental Services, Inc. (Hygienetics) collected samples of suspected asbestos-containing materials from the debris at the bottom of the southeast airshaft, located at 393 13th Street, Oakland, California.

Hygienetics inspector, Dan Gayton, a California Certified Asbestos Consultant and an EPA accredited Asbestos Building Inspector, collected a total of three (3) samples of suspect materials and submitted them to:

Hygienetics Environmental Services Laboratory
98 North Washington Street
Boston, MA 02114

Hygienetics Laboratory is accredited under the National Institute of Standards and Technology's National Voluntary Laboratory Accreditation Program (NVLAP), and the State of California Department of Health Services Environmental Laboratory Accreditation Program (ELAP) for the analysis of asbestos bulk material samples.

Bulk material samples were analyzed by Polarized Light Microscopy (PLM). Using PLM, the analyst is able to determine the type and concentration of asbestos in sampled material. The estimated asbestos concentration is given as a percentage of the total weight of the sample analyzed. The effective limit of detection by this method is one tenth of one percent (0.1%).

RESULTS:

No asbestos was detected in the three samples. The results of the PLM analysis for asbestos content are as follows:

Sample ID	Material	Sample Location	Asbestos Content
32001-1062-01	Debris including plaster, concrete and miscellaneous dust	Rear bottom of southeast airshaft	None Detect
32001-1062-02	Debris including plaster, concrete and miscellaneous dust	Center bottom of southeast airshaft	None Detect
32001-1062-03	Debris including plaster, concrete and miscellaneous dust	Front bottom of southeast airshaft	None Detect

Enclosed are the chain-of-custody/bulk sample data forms for the survey. If additional materials are discovered during renovation activities that are not listed here, they will need to be sampled prior to activities that may disturb them. If you have any questions please do not hesitate to contact me at (510) 749-1003.

Sincerely,
Hygienetics Environmental Services, Inc.

Dan Gayton
Project Manager
Certified Asbestos Consultant
#97-2258 exp.10/15/2001
Enclosures

H: 4044.022/PLN rpt.doc

617 742 4285

BESTOS BULK SAMPLE DATA FORM

JECT: 393 13TH ST, OAKLAND, CA / AIR SHAFT DEBRIS

SAMPLE ID NO.	TYPE*	FLOOR #	DESCRIPTION OF SAMPLING LOCATION & COMMENTS	GROUP
32001-1052-01	B	1	REAR BOTTOM OF S.E. AIR SHAFT / DEBRIS	
-02	↓	1	CENTER " " " " " "	
-03	↓	1	FRONT " " " " " " / ↓	

ACCOUNTABILITY RECORD | PAGE 1 OF 1

REQUESTED COMPLETION DATE: 3/21/01 ASAP

JOB NO.: 4044.022 BATCH: SF-13047

CLIENT NAME: G.S.A. - ALAMEDA

SAMPLER'S NAME: D. BAYTON

SIGNATURE: D. Bayton

DATE: 3/20/01 TIME:

METHOD OF SHIPMENT: FED-EX

LAB NAME: HES

ADDRESS:

RECEIVED BY:

DATE: TIME: SIGNATURE:

ANALYST: [signature] DATE: 3-21-01

LAB QC APPROVAL: [signature]

☐ ANALYZE TO FIRST POSITIVE BY GROUP ☒ FAX REPORT

☒ PRINTED REPORT REQUIRED ☐ E-MAIL REPORT

M ANALYTICAL LABORATORY RESULTS

LAB ID NO.	ASBESTOS CONCENTRATIONS**						CONCENTRATIONS OF OTHER COMPONENTS							SAMPLE COLOR	PC CONC	NY-PC CONC	CA-PC CONC	ANALY
	CH	AM	CR	AC	AN	TR	FG	MW	CL	SY	HA	NF	OT					
0913047-001									✓			✓		Gray				
002									✓			✓		Gray				
003									✓			✓		Gray				

Post-it® Fax Note 7671 # of pages ▶

To DAN BAYTON Date

Co./Dept. From LAB

Phone # Co.

Fax # Phone #

Fax #

ADDITIONAL COMMENTS:

*SAMPLE TYPE CODES	ASBESTOS TYPE CODES	ABBREVIATIONS FOR OTHER COMPONE
B = BULK MATERIAL D = DEBRIS SAMPLE SDT = SURFACE DUST—TAPE SAMPLE SDV = SURFACE DUST—VACUUM SAMPLE SDG = SURFACE DUST—GRAB SAMPLE	CH = CHRYSOTILE AM = AMOSITE CR = CROCIDOLITE AC = ACTINOLITE AN = ANTHOPHYLLITE TR = TREMOLITE **CONCENTRATIONS OBTAINED BY CALIBRATED VISUAL ESTIMATION TECHNIQUE UNLESS OTHERWISE NOTED	FG = FIBERGLASS MW = MINERAL WOOL CL = CELLULOSE SY = SYNTHETIC FIBER HA = HAIR NF = NON-FIBROUS MATERIAL OT = OTHER PC = POINT COUNTING NY-PC = NEW YORK STATE POINT COUNTING CA-PC = CALIFORNIA STATE POINT COUNTING

NO. OF SAMPLES SUBMITTED: 3 RATE: $10

CONFIRMATION NO.:

WHITE (ORIGINAL) SHEET — LABORATORY YELLOW SHEET — FIELD OFFICE REV. 07/1999

0464U

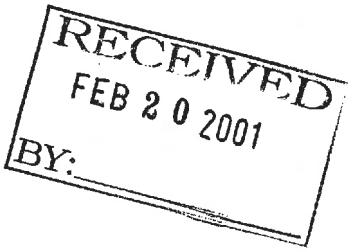
Hygienetics Environmental

Hygienetics Environmental Services, Inc.

1210 Marina Village Pkwy, #104
Alameda, CA 94501

Phone: (510) 749-1003
Fax: (510) 749-1069

February 16, 2001



Mr. David Speer
Real Estate Projects Manager
General Services Agency
1401 Lakeside Drive, 10thFloor
Oakland, California 94612-4305

RE: Asbestos Sampling / Plaster
1st Floor High Ceiling
393 13 th Street, Oakland, California

Dear Mr. Speer:

On February 14, 2001 Hygienetics Environmental Services, Inc. (Hygienetics) collected samples of suspected asbestos-containing materials from the 1st floor, high plaster ceiling, located at 393 13th Street, Oakland, California.

Hygienetics inspector, Dan Gayton, a California Certified Asbestos Consultant and an EPA accredited Asbestos Building Inspector, collected a total of five (5) samples of suspect materials and submitted them to:

Hygienetics Environmental Services Laboratory
98 North Washington Street
Boston, MA 02114

Hygienetics Laboratory is accredited under the National Institute of Standards and Technology's National Voluntary Laboratory Accreditation Program (NVLAP), and the State of California Department of Health Services Environmental Laboratory Accreditation Program (ELAP) for the analysis of asbestos bulk material samples.

Bulk material samples were analyzed by Polarized Light Microscopy (PLM). Using PLM, the analyst is able to determine the type and concentration of asbestos in sampled material. The estimated asbestos concentration is given as a percentage of the total weight of the sample analyzed. The effective limit of detection by this method is one percent (1%).

RESULTS:

The results of the PLM analysis for asbestos content are as follows:

Sample ID	Material	Sample Location	Asbestos Content
021401-1062-01	Ceiling Plaster	1st Floor High Ceiling / SW Corner	<1% Chrysotile
021401-1062-02	Ceiling Plaster	1st Floor High Ceiling / SE Corner	<1% Chrysotile
021401-1062-03	Ceiling Plaster	1st Floor High Ceiling / NE Corner	<1% Chrysotile
021401-1062-04	Ceiling Plaster	1st Floor High Ceiling / NW Side	<1% Chrysotile
021401-1062-05	Ceiling Plaster	1st Floor High Ceiling / West Center	<1% Chrysotile

RECOMMENDATIONS:

All asbestos-containing materials must be removed or handled in accordance with applicable regulations prior to impact by renovation or demolition activities. Certain California regulations now define asbestos-containing materials as those materials having an asbestos content of greater than one tenth of one percent (>0.1%).

Enclosed are the chain-of-custody/bulk sample data forms for the survey, and a sample location map. If additional materials are discovered during renovation activities that are not listed here, they will need to be sampled prior to activities that may disturb them. If you have any questions please do not hesitate to contact me at (510) 749-1003.

Sincerely,
Hygienetics Environmental Services, Inc.

Dan Gayton

Dan Gayton
Project Manager
Certified Asbestos Consultant
#97-2258 exp.10/15/2001
Enclosures

H: 4044.020/ltrrept

ASBESTOS BULK SAMPLE DATA FORM

PROJECT: 393 13TH ST, OAKLAND, CA. HIGH CEILING 1ST FLOOR.

	SAMPLE ID NO.	TYPE*	FLOOR #	DESCRIPTION OF SAMPLING LOCATION & COMMENTS	GROUP
1	02140-1002 - 01	B	1	PLASTER / HIGH CEILING 1ST. FLOOR	
2	02				
3	03				
4	04				
5	05				
6					
7					
8					
9					
10					
11					
12					

ACCOUNTABILITY RECORD | PAGE 1 OF 1

REQUESTED COMPLETION DATE: 2/15/01

JOB NO: 4044.020 / BATCH: SF-12491

CLIENT NAME: G.S.A. ALAMEDA

SAMPLER'S NAME: D. Dayton

SIGNATURE: D. Dayton

DATE: 2/14/01 TIME:

METHOD OF SHIPMENT: FED-EX

LAB NAME: HASL

ADDRESS: BOSTON

RECEIVED BY: BOB BOSIAZ

DATE: 2/15/01 TIME: 3:00 SIGNATURE:

ANALYST: DATE: 02.15.01

LAB QC APPROVAL:

☐ ANALYZE TO FIRST POSITIVE BY GROUP ☐ FAX REPORT

☐ PRINTED REPORT REQUIRED ☐ E-MAIL REPORT

PLM ANALYTICAL LABORATORY RESULTS

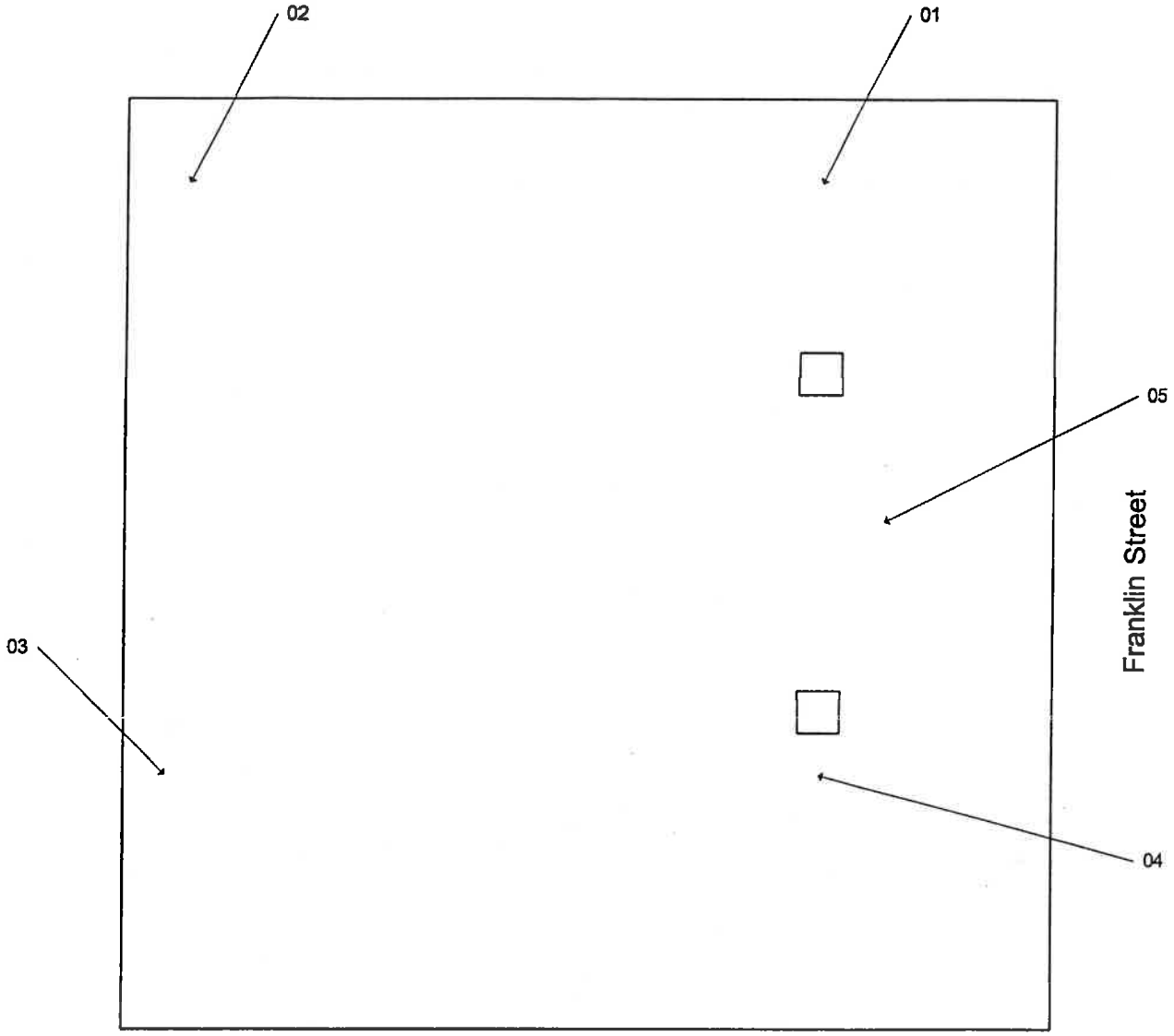
	LAB ID NO.	ASBESTOS CONCENTRATIONS**						CONCENTRATIONS OF OTHER COMPONENTS							SAMPLE COLOR	PC CONC	NY-PC CONC	CA-PC CONC	ANALYSIS COMMENTS
		CH	AM	CR	AC	AN	TR	FG	MW	CL	SY	HA	NF	OT					
1	012991-001	<1											100		Gy				
2	002	<1											100		Gy				
3	003	<1											100		Gy				
4	004	<1											100		Gy				
5	005	<1											100		Gy				
6																			
7																			
8																			
9																			
10																			
11																			
12																			

ADDITIONAL COMMENTS:

*SAMPLE TYPE CODES	ASBESTOS TYPE CODES	ABBREVIATIONS FOR OTHER COMPONENTS	NO. OF SAMPLES SUBMITTED	RATE
B = BULK MATERIAL D = DEBRIS SAMPLE SDT = SURFACE DUST—TAPE SAMPLE SDV = SURFACE DUST—VACUUM SAMPLE SDG = SURFACE DUST—GRAB SAMPLE	CH = CHRYSOTILE AM = AMOSITE CR = CROCIDOLITE AC = ACTINOLITE AN = ANTHOPHYLLITE TR = TREMOLITE **CONCENTRATIONS DETERMINED BY CALIBRATED VISUAL ESTIMATION TECHNIQUE UNLESS OTHERWISE NOTED	FG = FIBERGLASS MW = MINERAL WOOL CL = CELLULOSE SY = SYNTHETIC FIBER HA = HAIR NF = NON-FIBROUS MATERIAL OT = OTHER PC = POINT COUNTING NY-PC = NEW YORK STATE POINT COUNTING CA-PC = CALIFORNIA STATE POINT COUNTING	CONFIRMATION NO.:	

WHITE (ORIGINAL) SHEET — LABORATORY YELLOW SHEET — FIELD OFFICE

REV. 07/2000



Legend:
Sample Prefix:
+ : Positive Sample Location

General Services Agency 393 13th Street Oakland, CA	**Hygienetics Environmental**	Floor Plan 1st Floor - High Ceiling	February 2001
		Project No. 4044.020	
		Not to Scale	

County of Alameda

Miscellaneous Lead Sampling Data

04640

ASBESTOS TEM LABORATORIES, INC.

EPA 3050B (modified) / EPA 7420 (modified)
Atomic Absorption Spectroscopy
Lead Paint Analysis Report

Laboratory Job # **1434-01331**

600 Bancroft Way, Ste. A
Berkeley, CA 94710
(510) 704-8930
FAX (510) 704-8429

ASBESTOS TEM LABORATORIES, INC

AIHA LAP, LLC
ACCREDITED LABORATORY
LAB # 101754
California DPH
ELAP ID #1866

Jul/06/2016

S. Steiner
Terracon Consultants, Inc.
1466 66th Street
Emeryville, CA 94608

RE: LABORATORY JOB # 1434-01331
Atomic Absorption Spectroscopy analytical results for 2 paint sample(s).
Job Site: 393 13th St. Oakland
Job No.: R1167716

Enclosed please find results for the atomic absorption spectroscopy (AA) metals analysis of one or more solid samples following procedures from EPA publication SW-846, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods". Sample preparation procedures were performed according to EPA 3050B (modified) acid digestion of sediments, sludges, and soils. Sample analysis procedures were performed by EPA 7420 (modified) direct aspiration flame analysis.

Prior to analysis, samples are checked for damage and disruption of the chain-of-custody seal. Samples are then logged-in, each given a unique laboratory number, and a hard copy containing all pertinent information is generated. This, and all other relevant paper work are kept with each sample throughout the analytical procedures to assure proper analysis.

A portion of each sample is weighed out such that an aliquot of 1 to 2 grams is obtained for soils or solid waste, and ~0.2 grams is obtained for paint chips. The weighed sample material is then placed into a digestion vessel, transferred to a fume hood, heated at ~95 Deg. C, refluxed with nitric acid to solubilize the contained metals, and treated with hydrogen peroxide to oxidize any organic binder present in the sample material. High purity water is added to make a 50 ml volume for each sample.

AA analysis is performed on a microprocessor controlled Perkin Elmer 2380 atomic absorption spectrophotometer, operating in the flame mode. Samples are diluted as needed to allow reading of concentrations in the calibration range. QC analyses are prepared and performed along with each sample batch to ensure accurate analytical determinations. Data is compiled into a standard report format and subjected to a thorough quality assurance check before the information is released to the client. Note: Sample results are not corrected for contamination based on the field blank(s) or other analytical blank(s).

Sincerely Yours,

Laboratory Manager
ASBESTOS TEM LABORATORIES, INC.

--- Results for routine quality control samples run in parallel to the samples reported here were within acceptable limits. These results relate only to the sample(s) tested and must not be reproduced, except in full, with the approval of the laboratory. ---

ATOMIC ABSORPTION SPECTROSCOPY
LEAD PAINT ANALYSIS REPORT
EPA 3050B Digestion / EPA 7000B Analysis Methods

Contact: S. Steiner
Address: Terracon Consultants, Inc.
1466 66th Street
Emeryville, CA 94608

Samples Submitted: 2
Samples Analyzed: 2
Job Site / No.
393 13th St. Oakland
R1167716

Report No.: 342330
Date Submitted: Jul-05-16
Date Reported: Jul-06-16

SAMPLE ID	METAL	SAMPLE RESULT	REPORTING LIMIT	LOCATION / DESCRIPTION
Pb-5 Lab ID # 1434-01331-001	Pb	740 mg/kg 0.074 %	49 mg/kg 0.005 %	White Plaster Wall. Bsmt. at lift Sampling Date: — Analysis Date: Jul-06-16 — Analyzed Weight (g): 0.2035
Pb-6 Lab ID # 1434-01331-002	Pb	170 mg/kg 0.017 %	53 mg/kg 0.005 %	Gray Metal Beam. 3rd Fl Patio HVAC Support Sampling Date: — Analysis Date: Jul-06-16 — Analyzed Weight (g): 0.1888
Lab ID #				Sampling Date — Analysis Date — Analyzed Weight (g)
Lab ID #				Sampling Date — Analysis Date — Analyzed Weight (g)
Lab ID #				Sampling Date — Analysis Date — Analyzed Weight (g)
Lab ID #				Sampling Date — Analysis Date — Analyzed Weight (g)
Lab ID #				Sampling Date — Analysis Date — Analyzed Weight (g)
Lab ID #				Sampling Date — Analysis Date — Analyzed Weight (g)
Lab ID #				Sampling Date — Analysis Date — Analyzed Weight (g)
Lab ID #				Sampling Date — Analysis Date — Analyzed Weight (g)

Analytical results posted above relate only to the material(s) tested.
The sample has not been blank corrected.

µg - micrograms **1% = 10,000 ppm** **1ppm = 1 mg/Kg**

Lab QC Reviewer Jo Ann Huerto — **Jo Ann Huerto**

Analyst Aida Marin — **Aida Marin**

342330 Terracon

☒ PM – S. Steiner sbsteiner@terracon.com	☐ PM – K. Schroeder kmschroeter@terracon.com	☐ PM – K. Pilgrim kmpilgrim@terracon.com
☐ PM – M. Bryant mvbryant@terracon.com	☐ PM – T. Kaltchee takaltchee@terracon.com	☐ PM- M. Benefield msbenefield@terracon.com
☐ PM D. Ufferfilge dufferfilge@terracon.com	☐ PM – M. Bishop mrbishop@terracon.com	☐ PM – W. Frieszell wmfrieszell@terracon.com

LEAD PAINT
SAMPLE DATA SHEET

* Lead Analysis
☒ Flame AA (EPA 7420)
TTLC

PAGE 1 OF 1

Project Name/ Address/ Building No. 313 13th St. Oakland

Project# R1167716 **Sampled By:** M.L.B **Sampling Date:** 7/5/16

Sample(s) sent to: ☐ MAL ☐ EMSL ☐ Aerobiology ☐ Quantem Other _____

TAT ☐ Rush ☐ 24HRS ☒ 48HRS ☐ 3-5 Day

FAX OR E-MAIL REPORT TO: *SEE ABOVE PROJECT MANAGER (PM)*

***ADDITIONAL REPORT RECIPIENT(S): _____ ***

Sample ID	Paint Description and Sample Location	Condition (I/F/P)
PB5	Paint Color: White Substrate: Plaster Component: Wall Sample Location: Bldg # _____ Unit # _____ Room _____ Beam at 1.7	
PB6	Paint Color: Grey Substrate: Metal Component: Beam Sample Location: Bldg # _____ Unit # _____ Room _____ 3rd Fl. Partial HVAC Support	
	Paint Color: _____ Substrate: Plaster Component: _____ Sample Location: Bldg # _____ Unit # _____ Room _____	
	Paint Color: _____ Substrate: _____ Component: _____ Sample Location: Bldg # _____ Unit # _____ Room _____	
	Paint Color: _____ Substrate: _____ Component: _____ Sample Location: Bldg # _____ Unit # _____ Room _____	

Relinquished By:	M.L.B	**Signature:**	**Date/Time:** 7/5/16
Received By:	AYEM	**Signature:**	**Date/ Time:** 7/5 @ 17:40
Received By:		**Signature:**	**Date/Time:**

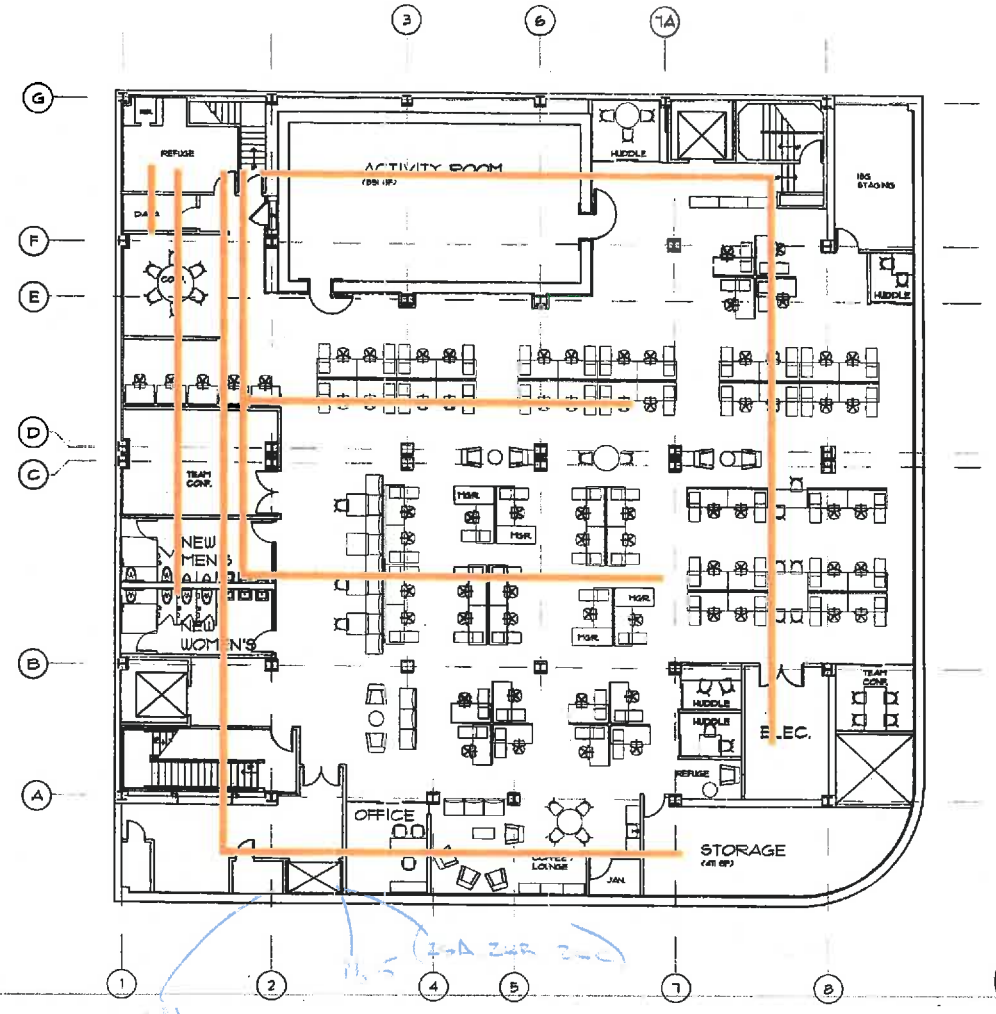
1466 66th Street Emeryville CA 94608 Tel: (510) 547-7771 Fax: (510) 547-1983

Appendix A

Mechanical Ductwork Sketch

Total Length x 1.2 Safety Factor ~
2700 lineal feet

Shown are Supply Ducts



(60) WORK BENCHES
(4) MANAGER'S SEATING
(1) OFFICE
(5) CONTRACTOR'S STATIONS
(3) SMALL CONFERENCE
(4) HUDDLE ROOMS
I5G STAGING ROOM
ACTIVITY ROOM
REFUGE
COFFEE / LOUNGE
STORAGE

1/A1 BASEMENT PLAN
SCALE: 1/16" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
427 THIRTEENTH STREET
OAKLAND, CA 94612
PH: 510.446.2244 FX: 510.446.2242

BASEMENT

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

GENERAL SERVICES AGENCY GSA COUNTY OF ALAMEDA

DATE: 02/24/2015
DRAWN BY: wy
JOB NO.: 1203.22

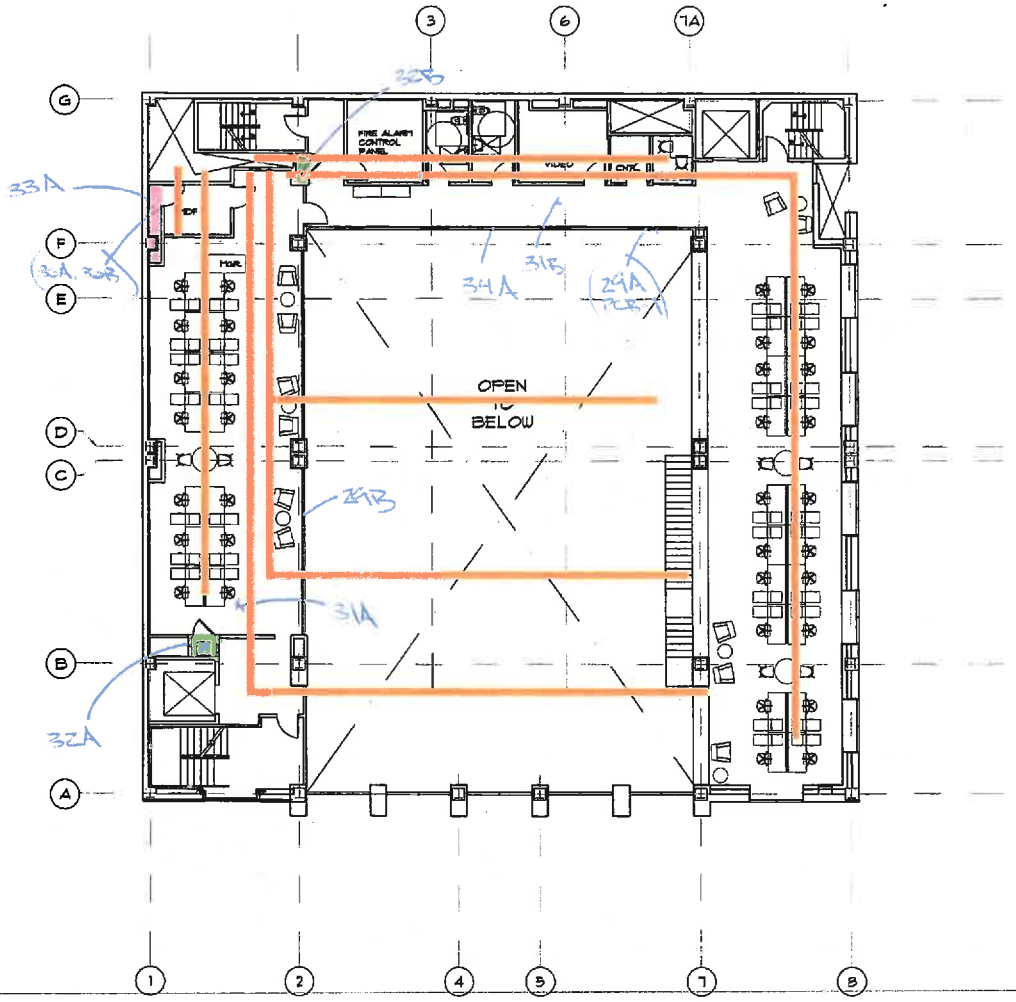
A1

Appendix A

Mechanical Ductwork Sketch

: HM-30

: HM-32



(33) WORK BENCHES
(1) MANAGER'S SEATING
(2) HUDDLE SPACES
(0) CONTRACTOR'S STATIONS
(1) VIDEO / OFFICE
(2) RESTROOMS
MDF ROOM

1/A3 MEZZANINE FLOOR PLAN
SCALE: 1/16" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
427 THIRTEENTH STREET
OAKLAND, CA 94612
Ph: 510.448.2244 Fx: 510.448.2242
ktarch.com www.ktarch.com

MEZZANINE

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

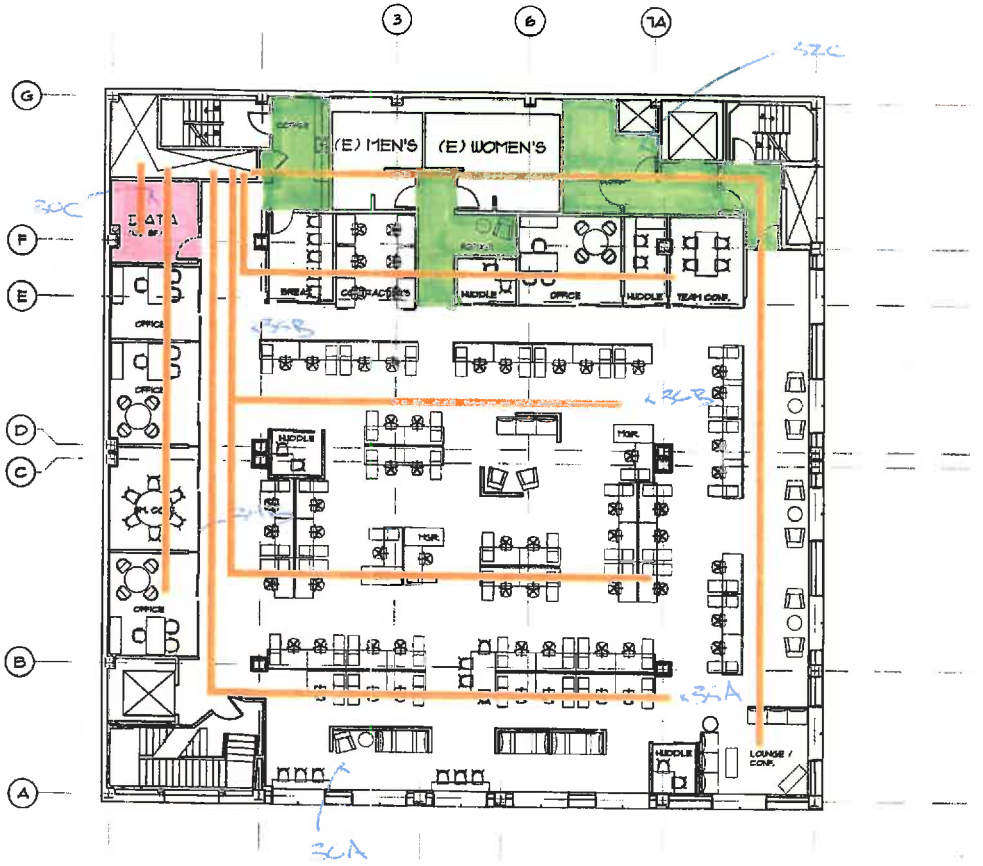
GENERAL SERVICES AGENCY COUNTY OF ALAMEDA

DATE: 02/24/2015
DRAWN BY: wy
JOB NO.: 1203.22

A3

Appendix A

Mechanical Ductwork Sketch



(51) WORK BENCHES
(3) MANAGER'S SEATING
(4) HUDDLE SPACES
(6) CONTRACTOR'S STATIONS
(4) OFFICES
(3) SMALL CONFERENCE
(1) BREAK
(1) COFFEE
(1) LOUNGE / CONFERENCE
(1) RETREAT

1/A4 SECOND FLOOR PLAN
SCALE: 1/16" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
427 THIRTEENTH STREET
OAKLAND, CA 94612
Ph: 510.448.2244 Fx: 510.448.2242
kta@ktarch.com www.ktarch.com

SECOND FLOOR

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

GENERAL SERVICES AGENCY GSA COUNTY OF ALAMEDA

DATE: 02/24/2016
DRAWN BY: wy
JOB NO.: 1203.22

A4

Appendix A

Mechanical Roof Layout with Acoustical Data

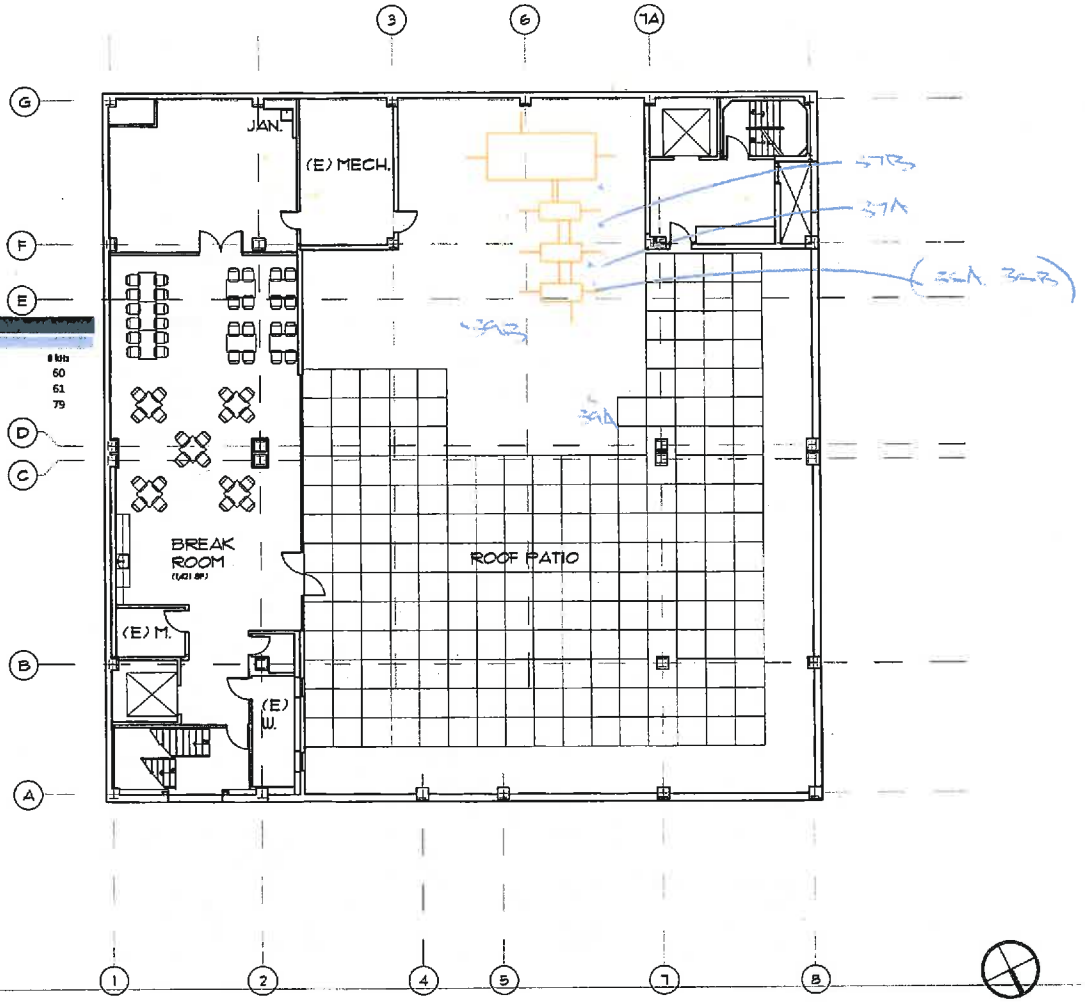
DOAS w/VRF

Daikin Rebel DOAS 77"x183"
1 unit of 10000 cfm, 26 ton

Sound	Sound Power (dB)							
Frequency	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Inlet	90	89	87	82	81	75	67	60
Discharge	90	86	87	82	81	76	68	61
Radiated	-	91	88	86	86	82	80	79

Mitsbushi Heat Pump 69"x30"
3 units of 22 tons each

Sound Pressure Level (Measured In Anechoic Room)	dB(A)	63.5



BREAK ROOM
ROOF PATIO
SHOWER

1/A5 THIRD FLOOR PLAN
SCALE: 1/8" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
427 THIRTEENTH STREET
OAKLAND, CA 94612
Ph: 510.448.2244 Fx: 510.448.2242

THIRD FLOOR

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

DATE: 02/24/2015
DRAWN BY: wy
JOB NO.: 1203.22

A5

ASBESTOS TEM LABORATORIES, INC.

EPA 3050B (modified) / EPA 7420 (modified)
Atomic Absorption Spectroscopy
Lead Paint Analysis Report

Laboratory Job # **1434-01129**

600 Bancroft Way, Ste. A
Berkeley, CA 94710
(510) 704-8930
FAX (510) 704-8429

ASBESTOS TEM LABORATORIES, INC

AIHA LAP, LLC
ACCREDITED LABORATORY
LAB # 101754
California DPH
ELAP ID #1866

May/09/2016

Steffan Steiner
Terracon Consultants, Inc.
1466 66th Street
Emeryville, CA 94608

RE: LABORATORY JOB # 1434-01129
Atomic Absorption Spectroscopy analytical results for 2 paint sample(s).
Job Site: 393 13th Street, Oakland
Job No.: R1167631

Enclosed please find results for the atomic absorption spectroscopy (AA) metals analysis of one or more solid samples following procedures from EPA publication SW-846, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods". Sample preparation procedures were performed according to EPA 3050B (modified) acid digestion of sediments, sludges, and soils. Sample analysis procedures were performed by EPA 7420 (modified) direct aspiration flame analysis.

Prior to analysis, samples are checked for damage and disruption of the chain-of-custody seal. Samples are then logged-in, each given a unique laboratory number, and a hard copy containing all pertinent information is generated. This, and all other relevant paper work are kept with each sample throughout the analytical procedures to assure proper analysis.

A portion of each sample is weighed out such that an aliquot of 1 to 2 grams is obtained for soils or solid waste, and ~0.2 grams is obtained for paint chips. The weighed sample material is then placed into a digestion vessel, transferred to a fume hood, heated at ~95 Deg. C, refluxed with nitric acid to solubilize the contained metals, and treated with hydrogen peroxide to oxidize any organic binder present in the sample material. High purity water is added to make a 50 ml volume for each sample.

AA analysis is performed on a microprocessor controlled Perkin Elmer 2380 atomic absorption spectrophotometer, operating in the flame mode. Samples are diluted as needed to allow reading of concentrations in the calibration range. QC analyses are prepared and performed along with each sample batch to ensure accurate analytical determinations. Data is compiled into a standard report format and subjected to a thorough quality assurance check before the information is released to the client. Note: Sample results are not corrected for contamination based on the field blank(s) or other analytical blank(s).

Sincerely Yours,

Laboratory Manager
ASBESTOS TEM LABORATORIES, INC.

--- Results for routine quality control samples run in parallel to the samples reported here were within acceptable limits. These results relate only to the sample(s) tested and must not be reproduced, except in full, with the approval of the laboratory. ---

ATOMIC ABSORPTION SPECTROSCOPY
LEAD PAINT ANALYSIS REPORT
EPA 3050B Digestion / EPA 7000B Analysis Methods

Contact: Steffan Steiner
Address: Terracon Consultants, Inc.
1466 66th Street
Emeryville, CA 94608

Samples Submitted: 2
Samples Analyzed: 2
Job Site / No.
393 13th Street, Oakland
R1167631

Report No.: 340897
Date Submitted: May-06-16
Date Reported: May-09-16

SAMPLE ID	METAL	SAMPLE RESULT	REPORTING LIMIT	LOCATION / DESCRIPTION
Pb-01 Lab ID # 1434-01129-001	Pb	4400 mg/kg 0.440 %	44 mg/kg 0.004 %	Mezz. W side fire escape Sampling Date: — Analysis Date: May-09-16 Analyzed Weight (g): 0.2296
Pb-02 Lab ID # 1434-01129-002	Pb	< 47 mg/kg < 0.005 %	47 mg/kg 0.005 %	1st Floor NW perim wall Sampling Date: — Analysis Date: May-09-16 Analyzed Weight (g): 0.2119
Lab ID #				Sampling Date: — Analysis Date: — Analyzed Weight (g): —
Lab ID #				Sampling Date: — Analysis Date: — Analyzed Weight (g): —
Lab ID #				Sampling Date: — Analysis Date: — Analyzed Weight (g): —
Lab ID #				Sampling Date: — Analysis Date: — Analyzed Weight (g): —
Lab ID #				Sampling Date: — Analysis Date: — Analyzed Weight (g): —
Lab ID #				Sampling Date: — Analysis Date: — Analyzed Weight (g): —
Lab ID #				Sampling Date: — Analysis Date: — Analyzed Weight (g): —
Lab ID #				Sampling Date: — Analysis Date: — Analyzed Weight (g): —

Analytical results posted above relate only to the material(s) tested.
The sample has not been blank corrected.

µg - micrograms **1% = 10,000 ppm** **1ppm = 1 mg/Kg**

Lab QC Reviewer Jo Ann Huerto — **Jo Ann Huerto**

Analyst Jie Zhang — **Jie Zhang**

Terracon

☒ PM – S. Steiner sbsteiner@terracon.com
☐ PM – K. Schroeter kmschroeter@terracon.com
☐ PM – K. Pilgrim kmpilgrim@terracon.com
☐ PM – M. Bryant mvbryant@terracon.com
☐ PM – T. Kallchee takallchee@terracon.com
☐ PM – B. Gils regils@terracon.com
☐ PM- M. Benefield msbenefield@terracon.com
☐ PM D. Utterfige dutterfilge@terracon.com
☐ PM- M. Benefield msbenefield@terracon.com
☐ PM – M. Bishop mrbishop@terracon.com
☐ PM – W. Frieszell wmfrieszell@terracon.com

LEAD PAINT
SAMPLE DATA SHEET

* Lead Analysis
☒ Flame AA (EPA 7420)
☐ TTLC

PAGE 1 OF 1

Project Name/ Address/ Building No. 393 13th St. Oakland **PO#**

Project# R1K7C31 **Sampled By:** M.L.B **Sampling Date:** 5/6/16

Sample(s) sent to: ☐ RGA ☐ EMSL ☒ Other Advanced-TEM **TAT** ☒ Rush ☒ 24HRS ☐ 3-5 days

FAX OR E-MAIL REPORT TO: *SEE ABOVE PROJECT MANAGER (PM)*

***ADDITIONAL REPORT RECIPIENT(S): ***

Sample ID	Paint Description and Sample Location	Condition (I/E/P)
Pb 01	Paint Color: Cream Substrate: Metal Component: Shutter Sample Location: Bldg # Unit # Room Above W Side Fire Escape	
Pb 02	Paint Color: White Substrate: Drywall Component: Wall Sample Location: Bldg # Unit # Room 1st Fl NW Room Wall	
	Paint Color: Substrate: Component: Sample Location: Bldg # Unit # Room	
	Paint Color: Substrate: Component: Sample Location: Bldg # Unit # Room	
	Paint Color: Substrate: Component: Sample Location: Bldg # Unit # Room	

Relinquished By: M.L.B **Signature:** **Date/Time:** 5/6/16
Received By: ATM **Signature:** **Date/ Time:** 5/6/16 2:38
Received By: **Signature:** **Date/Time:**

RIK7631 - 4/16

PRIMARY (WORKBENCHES, MANAGERS, CONTRACTORS)

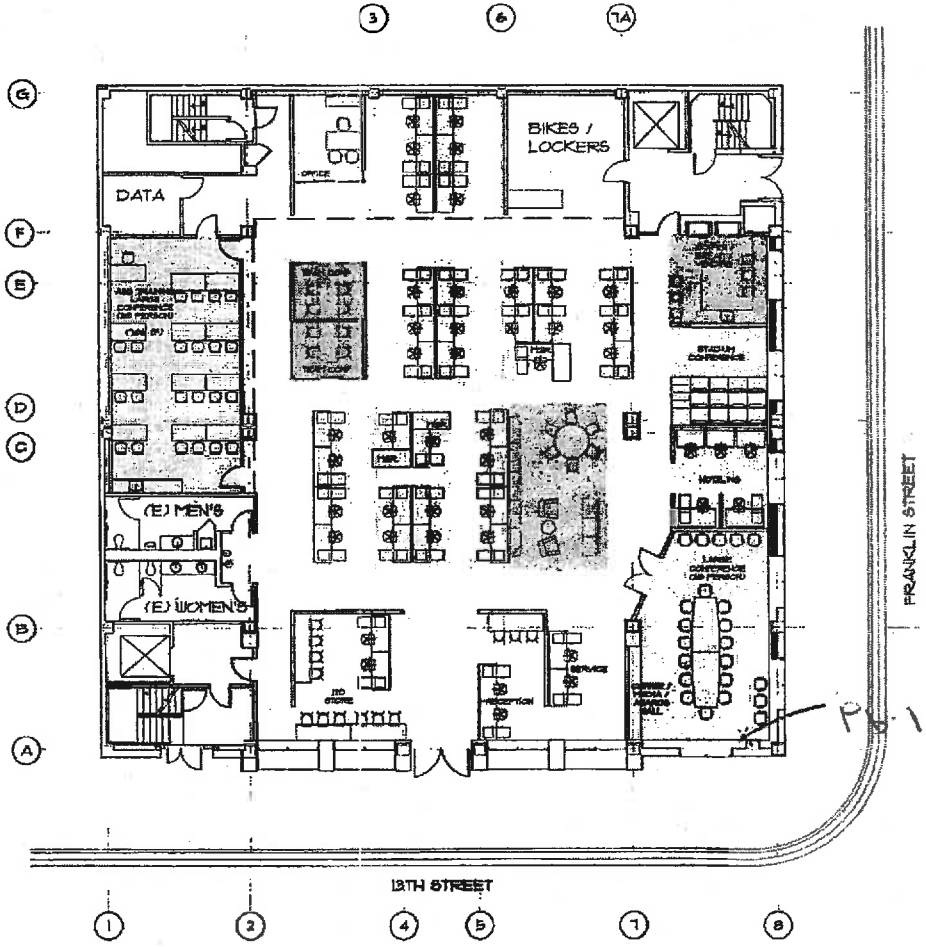
OFFICES

COMMUNITY + COLLABORATION

TEAM MEETING

CONFERENCE / ASSEMBLY

REFUGE



(31) WORK BENCHES
(3) MANAGER'S SEATING
(1) OFFICE
(3) CONTRACTOR'S STATIONS
(2) HOTELING
(2) RECEPTION
(2) "HOST"
(2) SERVICE
(2) SMALL CONFERENCE
ITD STORE
ASG TRAINING / LG. CONF.
LARGE CONFERENCE
STADIUM CONFERENCE
COFFEE / BREAK AREA
BIKES AND LOCKERS

1/A2 FIRST FLOOR PLAN

SCALE: 1/16" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
417 THIRTEENTH STREET
OAKLAND, CA 94612
PH: 510.444.2244 FX: 510.444.2242
info@kta.com www.kta.com

FIRST FLOOR

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

GENERAL SERVICES AGENCY
GSA
COUNTY OF ALAMEDA

DATE: 01/08/2015
DRAWN BY: WJ
JOB NO.: 1203.22

A2

E1167C51 5/2/16

PRIMARY (WORKBENCHES, MANAGERS, CONTRACTORS)

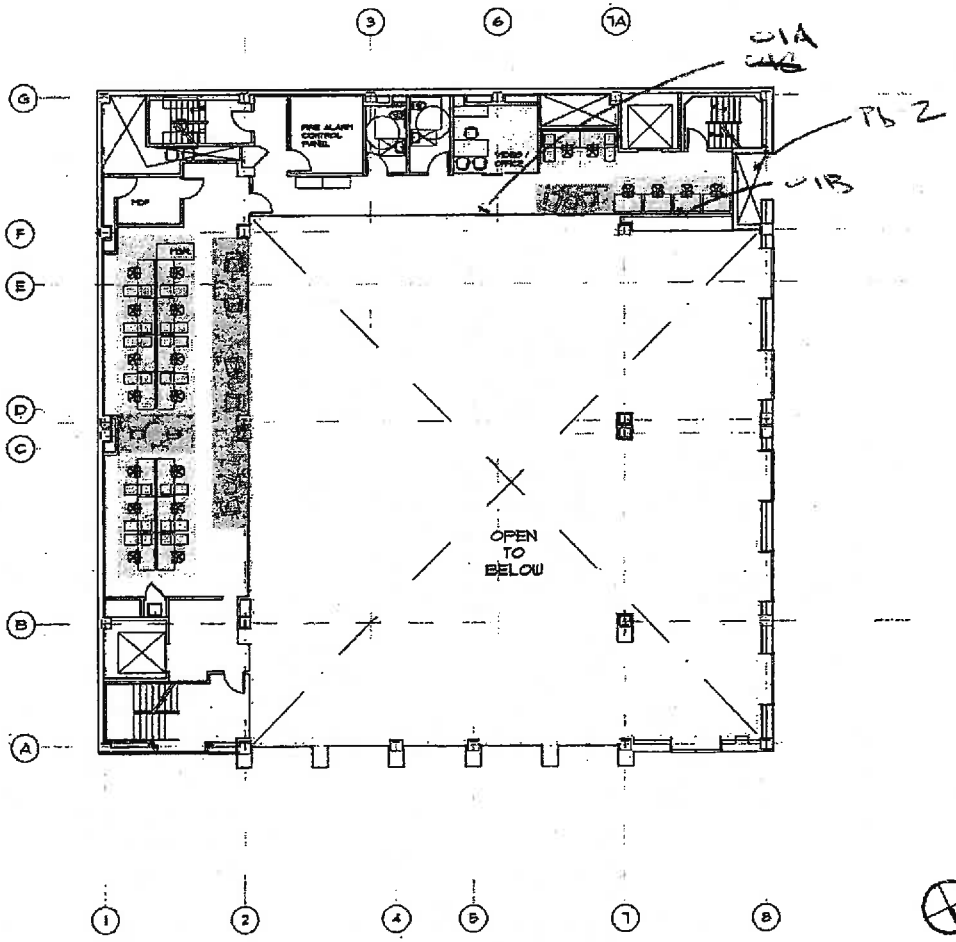
VIDEO / OFFICE

COMMUNITY & COLLABORATION

TEAM MEETING

CONFERENCE / ASSEMBLY

REFUGE



(18) WORK BENCHES
(1) MANAGER'S SEATING
(4) CONTRACTOR'S STATIONS
(1) VIDEO / OFFICE
(2) RESTROOMS
MDF ROOM

1/A3 MEZZANINE FLOOR PLAN

SCALE: 1/16" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
427 THIRTEENTH STREET
OAKLAND, CA 94612
PH: 510.446.2244 FX: 510.446.2241

MEZZANINE

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

GSA GENERAL SERVICES ADMINISTRATION COUNTY OF ALAMEDA

DATE: 01/05/2015
DRAWN BY: wy
JOB NO.: 1203.22

A3

R1167C51 sk/ic

PRIMARY (WORKBENCHES, MANAGERS, CONTRACTORS)

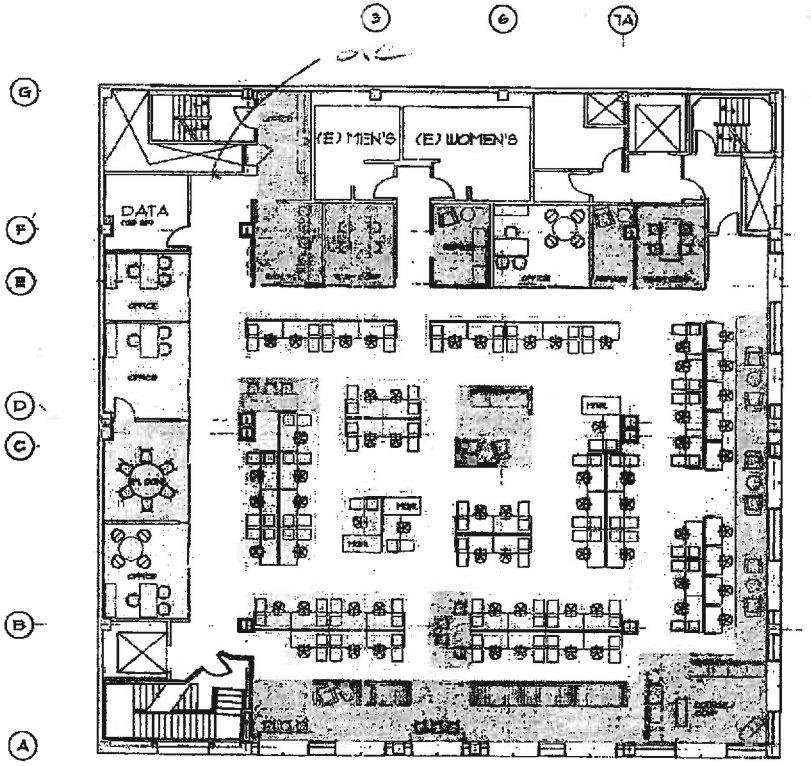
OFFICES

COMMUNITY + COLLABORATION

TEAM MEETING

CONFERENCE / ASSEMBLY

REFUGE



(52) WORK BENCHES
(3) MANAGER'S SEATING
(9) CONTRACTOR'S STATIONS
(4) OFFICES
(4) SMALL CONFERENCE
(1) BREAK
(1) COFFEE
(1) LOUNGE / CONFERENCE
(1) RETREAT

1/A4 SECOND FLOOR PLAN

SCALE: 1/16" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
427 THIRTEENTH STREET
OAKLAND, CA 94612
PH: 510.448.2244 FX: 510.448.2212

SECOND FLOOR

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

GENERAL SERVICES ADMINISTRATION
GSA
COUNTY OF ALAMEDA

DATE: 01/05/2015
DRAWN BY: sy
JOB NO.: 1203.22

A4

ASBESTOS TEM LABORATORIES, INC.

EPA 3050B (modified) / EPA 7420 (modified)
Atomic Absorption Spectroscopy
Lead Paint Analysis Report

Laboratory Job # **1434-00891**

600 Bancroft Way, Ste. A
Berkeley, CA 94710
(510) 704-8930
FAX (510) 704-8429

AIHA LAP, LLC
ACCREDITED LABORATORY
LAB # 101754
California DPH
ELAP ID #1866

ASBESTOS TEM LABORATORIES, INC

Mar/07/2016

S. Steiner
Terracon Consultants, Inc.
1466 66th Street
Emeryville, CA 94608

RE: LABORATORY JOB # 1434-00891
Atomic Absorption Spectroscopy analytical results for 4 paint sample(s).
Job Site: 393 13th St.
Job No.: R1167284

Enclosed please find results for the atomic absorption spectroscopy (AA) metals analysis of one or more solid samples following procedures from EPA publication SW-846, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods". Sample preparation procedures were performed according to EPA 3050B (modified) acid digestion of sediments, sludges, and soils. Sample analysis procedures were performed by EPA 7420 (modified) direct aspiration flame analysis.

Prior to analysis, samples are checked for damage and disruption of the chain-of-custody seal. Samples are then logged-in, each given a unique laboratory number, and a hard copy containing all pertinent information is generated. This, and all other relevant paper work are kept with each sample throughout the analytical procedures to assure proper analysis.

A portion of each sample is weighed out such that an aliquot of 1 to 2 grams is obtained for soils or solid waste, and ~0.2 grams is obtained for paint chips. The weighed sample material is then placed into a digestion vessel, transferred to a fume hood, heated at ~95 Deg. C, refluxed with nitric acid to solubilize the contained metals, and treated with hydrogen peroxide to oxidize any organic binder present in the sample material. High purity water is added to make a 50 ml volume for each sample.

AA analysis is performed on a microprocessor controlled Perkin Elmer 2380 atomic absorption spectrophotometer, operating in the flame mode. Samples are diluted as needed to allow reading of concentrations in the calibration range. QC analyses are prepared and performed along with each sample batch to ensure accurate analytical determinations. Data is compiled into a standard report format and subjected to a thorough quality assurance check before the information is released to the client. Note: Sample results are not corrected for contamination based on the field blank(s) or other analytical blank(s).

Sincerely Yours,

Laboratory Manager
ASBESTOS TEM LABORATORIES, INC.

--- Results for routine quality control samples run in parallel to the samples reported here were within acceptable limits. These results relate only to the sample(s) tested and must not be reproduced, except in full, with the approval of the laboratory. ---

ATOMIC ABSORPTION SPECTROSCOPY
LEAD PAINT ANALYSIS REPORT
EPA 3050B Digestion / EPA 7000B Analysis Methods

Contact: S. Steiner
Address: Terracon Consultants, Inc.
1466 66th Street
Emeryville, CA 94608

Samples Submitted: 4
Samples Analyzed: 4
Job Site / No.
393 13th St.
R1167284

Report No.: 339612
Date Submitted: Mar-04-16
Date Reported: Mar-07-16

SAMPLE ID	METAL	SAMPLE RESULT	REPORTING LIMIT	LOCATION / DESCRIPTION
PB-1 Lab ID # 1434-00891-001	Pb	62 mg/kg 0.006 %	49 mg/kg 0.005 %	White Drywall Wall 4th Floor Womens RR Sampling Date: — Analysis Date: Mar-07-16 Analyzed Weight (g): 0.2023
PB-2 Lab ID # 1434-00891-002	Pb	1800 mg/kg 0.180 %	46 mg/kg 0.005 %	White Plaster Wall 1st Fl - SW Stairwell Sampling Date: — Analysis Date: Mar-07-16 Analyzed Weight (g): 0.2176
PB-3 Lab ID # 1434-00891-003	Pb	9200 mg/kg 0.920 %	41 mg/kg 0.004 %	White Concrete Wall - 2nd Fl - Exterior Stairwell Sampling Date: — Analysis Date: Mar-07-16 Analyzed Weight (g): 0.245
PB-4 Lab ID # 1434-00891-004	Pb	300 mg/kg 0.030 %	48 mg/kg 0.005 %	Green Concrete Wall - 3rd Fl. Exterior Patio - W. Wall Sampling Date: — Analysis Date: Mar-07-16 Analyzed Weight (g): 0.2099
Lab ID #				Sampling Date: — Analysis Date: — Analyzed Weight (g): —
Lab ID #				Sampling Date: — Analysis Date: — Analyzed Weight (g): —
Lab ID #				Sampling Date: — Analysis Date: — Analyzed Weight (g): —
Lab ID #				Sampling Date: — Analysis Date: — Analyzed Weight (g): —
Lab ID #				Sampling Date: — Analysis Date: — Analyzed Weight (g): —
Lab ID #				Sampling Date: — Analysis Date: — Analyzed Weight (g): —

Analytical results posted above relate only to the material(s) tested.
The sample has not been blank corrected.

µg - micrograms **1% = 10,000 ppm** **1ppm = 1 mg/Kg**

Lab QC Reviewer Jo Ann Huerto — **Jo Ann Huerto**

Analyst Jie Zhang — **Jie Zhang**

Terracon

☒ PM – S. Steiner sasteiner@terracon.com
☐ PM – K. Schroeter kmschroeter@terracon.com
☐ PM – K. Pilgrim kmpilgrim@terracon.com
☐ PM – M. Bryant mwbryant@terracon.com
☐ PM – T. Kaltchee takaltchee@terracon.com
☐ PM – B. Gils regils@terracon.com
☐ PM- M. Benefield msbenefield@terracon.com
☐ PM D. Ufferfilge dufferfilge@terracon.com
☐ PM- M. Benefield msbenefield@terracon.com
☐ PM – M. Bishop mrbishop@terracon.com
☐ PM – W. Frieszell wmfrieszell@terracon.com

LEAD PAINT
SAMPLE DATA SHEET

* Lead Analysis
__ Flame AA (EPA 7420)
__ TTLC

PAGE 1 OF ____

Project Name/ Address/ Building No. 393 13TH ST. **PO#** ____

Project# R1167284 **Sampled By:** M. REED **Sampling Date:** 3-1-16

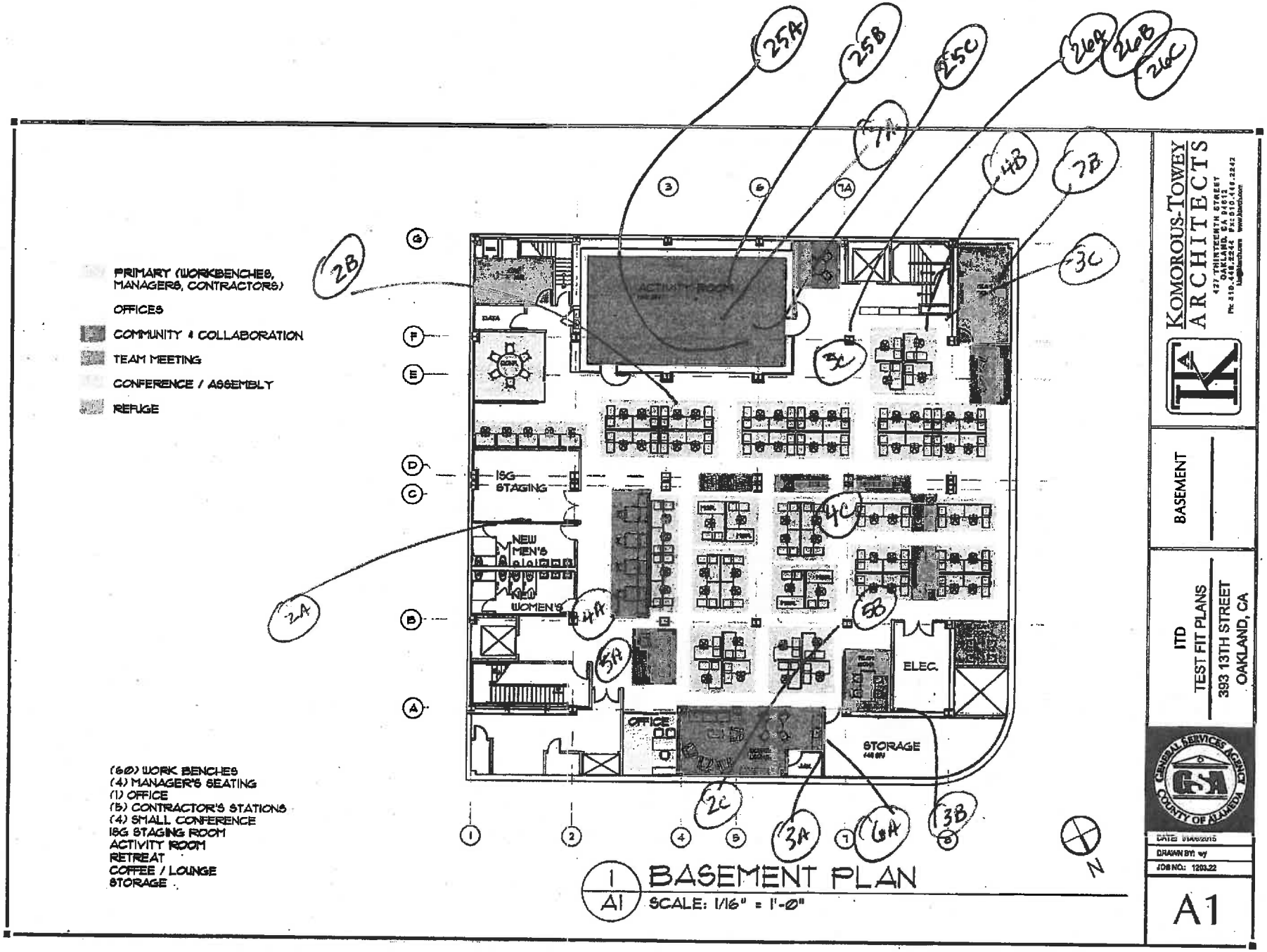
Sample(s) sent to: ☐ RGA ☐ EMSL ☐ Other ____ **TAT** ☐ Rush ☒ 24HRS ☐ 3-5 days

FAX OR E-MAIL REPORT TO: *SEE ABOVE PROJECT MANAGER (PM)*

***ADDITIONAL REPORT RECIPIENT(S): ____ ***

Sample ID	Paint Description and Sample Location	Condition (I/F/P)
Pb-1	Paint Color: WHITE Substrate: DRYWALL Component: WALL Sample Location: Bldg # ____ Unit # ____ Room ____ 4TH FLOOR WOMENS RR	
Pb-2	Paint Color: WHITE Substrate: PLASTER Component: WALL Sample Location: Bldg # ____ Unit # ____ Room ____ 1ST FL - (SW) STAIRWELL	
Pb-3	Paint Color: WHITE Substrate: CONCRETE Component: WALL Sample Location: Bldg # ____ Unit # ____ Room ____ 2ND FL. - EXTERIOR STAIRWELL	
Pb-4	Paint Color: GREEN Substrate: CONCRETE Component: WALL Sample Location: Bldg # ____ Unit # ____ Room ____ 3RD FL EXTERIOR PATIO - (W) WALL	
	Paint Color: ____ Substrate: ____ Component: ____ Sample Location: Bldg # ____ Unit # ____ Room ____	

Relinquished By: M. REED **Signature:** M. Reed **Date/Time:** 3-4-16
Received By: ASHLEY **Signature:** [signature] **Date/Time:** 3/6/16 1455
Received By: ____ **Signature:** ____ **Date/Time:** ____



1 / A1 BASEMENT PLAN

SCALE: 1/16" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
427 THIRTEENTH STREET
OAKLAND, CA 94612
PH: 510.448.2244 FX: 510.448.2242

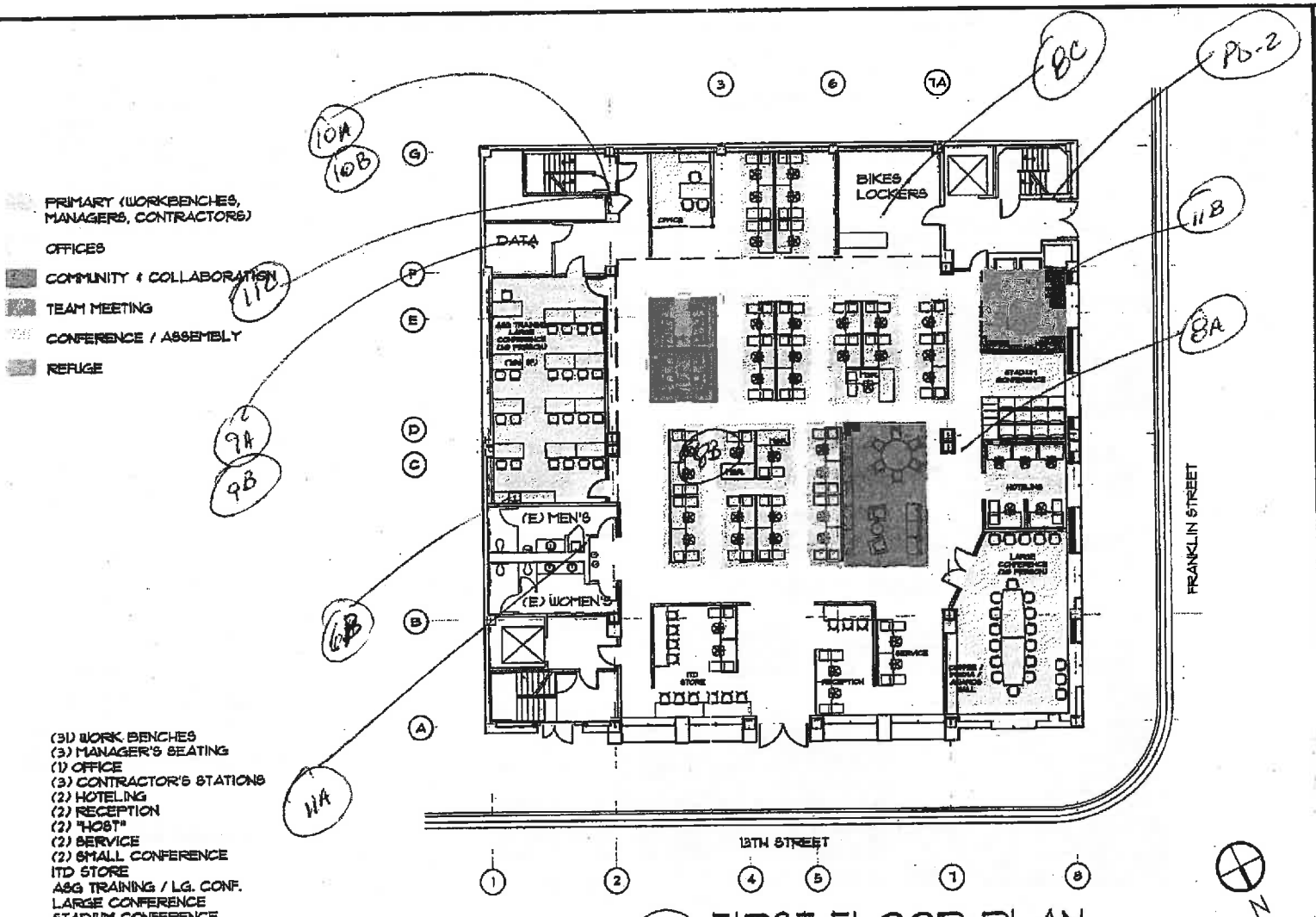
BASEMENT

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

GSA
GENERAL SERVICES ADMINISTRATION
COUNTY OF ALAMEDA

DATE: 01/05/2015
DRAWN BY: wy
JOB NO.: 1203.22

A1



1 / A2 FIRST FLOOR PLAN

SCALE: 1/16" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
427 THIRTEENTH STREET
OAKLAND, CA 94612
PH: 510.448.2344 FX: 510.448.2342
kta@ktaarch.com www.ktaarch.com

FIRST FLOOR

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

GENERAL SERVICES AGENCY COUNTY OF ALAMEDA

DATE: 01/09/2015
DRAWN BY: wj
JOB NO.: 1203.22

A2

PRIMARY (WORKBENCHES, MANAGERS, CONTRACTORS)

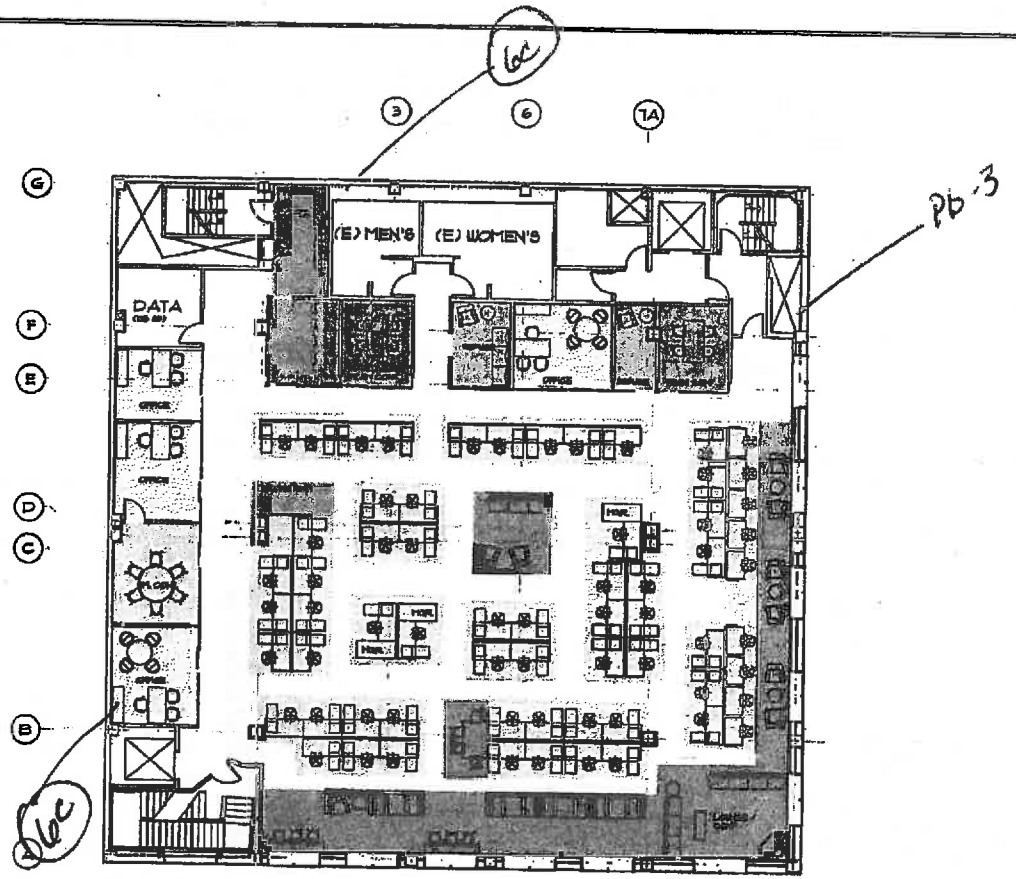
OFFICES

COMMUNITY & COLLABORATION

TEAM MEETING

CONFERENCE / ASSEMBLY

REFUGE



(52) WORK BENCHES
(3) MANAGER'S SEATING
(9) CONTRACTOR'S STATIONS
(4) OFFICES
(4) SMALL CONFERENCE
(1) BREAK
(1) COFFEE
(1) LOUNGE / CONFERENCE
(1) RETREAT

1/A4 SECOND FLOOR PLAN

SCALE: 1/16" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS

427 THIRTEENTH STREET
OAKLAND, CA 94612
PH: 510.446.2244 FX: 510.446.2242

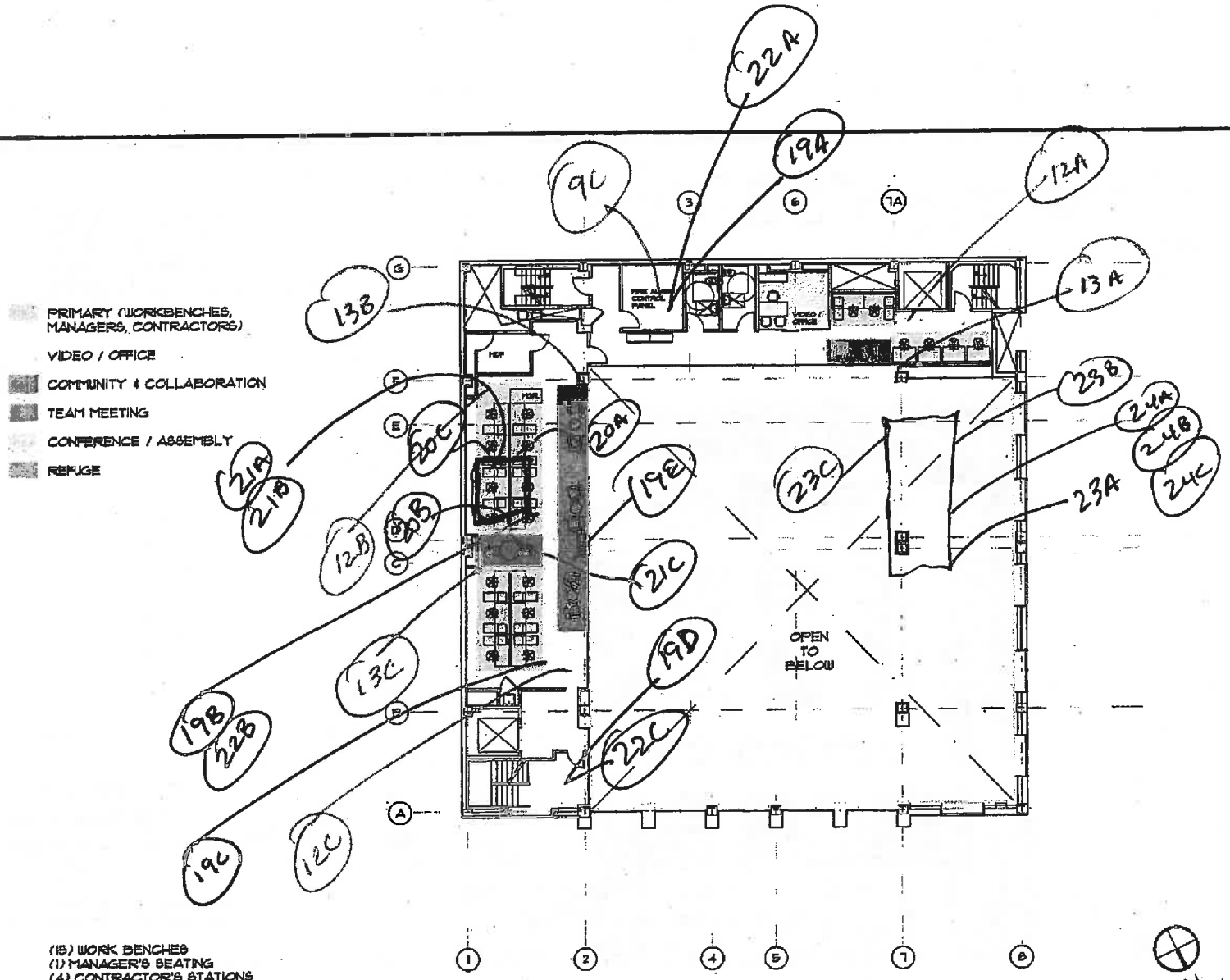
SECOND FLOOR

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

GENERAL SERVICES AGENCY
COUNTY OF ALAMEDA

DATE: 01/05/2015
DRAWN BY: wy
JOB NO.: 1203.22

A4



1/A3 MEZZANINE FLOOR PLAN

SCALE: 1/16" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS

427 THIRTEENTH STREET
OAKLAND, CA 94612
Ph: 510.446.2244 Fx: 510.446.2242
kta@ktarch.com www.ktarch.com

MEZZANINE

ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

DATE: 01/08/2015
DRAWN BY: wy
JOB NO.: 1203.22

A3

PRIMARY (WORKBENCHES, MANAGERS, CONTRACTORS)

OFFICES

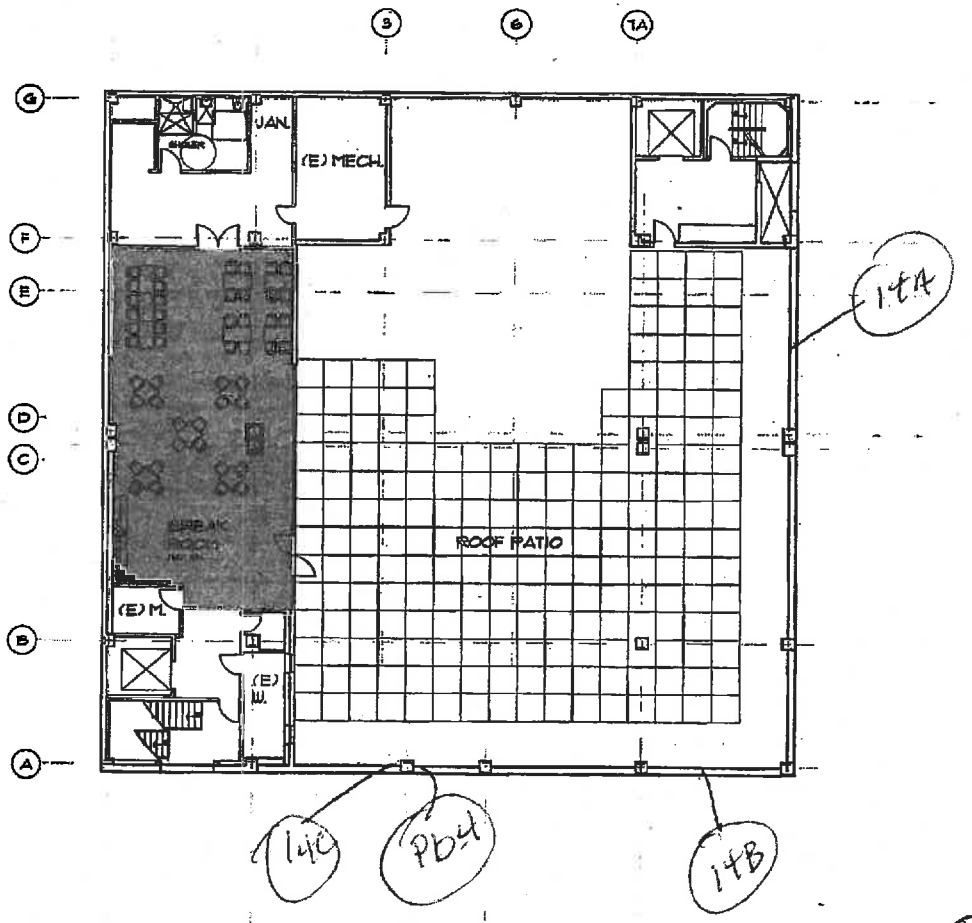
COMMUNITY + COLLABORATION

TEAM MEETING

CONFERENCE / ASSEMBLY

REFUGE

BREAK ROOM
ROOF PATIO
SHOWER



1/A5 THIRD FLOOR PLAN

SCALE: 1/8" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
427 THIRTEENTH STREET
OAKLAND, CA 94612
Ph: 510.444.2344 Fx: 510.444.2342
info@ktarch.com www.ktarch.com

THIRD FLOOR

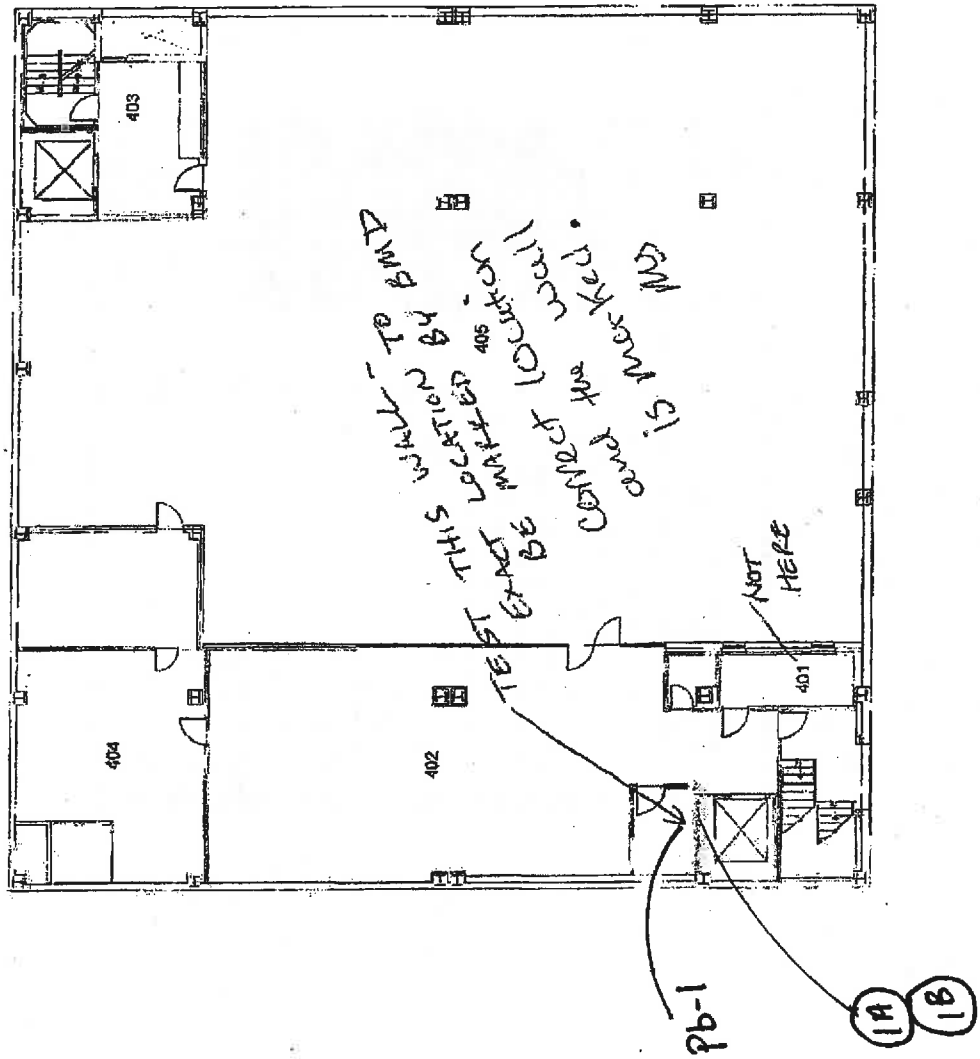
ITD
TEST FIT PLANS
393 13TH STREET
OAKLAND, CA

GENERAL SERVICES AGENCY
COUNTY OF ALAMEDA

DATE: 01/05/2015
DRAWN BY: sy
JOB NO.: 1203.22

A5

Bldg #-Drawing Name-Floor:	04640-DCSS-4th Flr.	USF:	1,666
Building Name:	DCSS	Print Date:	1/4/2008
Street Address:	393 13th Street	City:	Oakland



RLD6.04640

MICRO ANALYTICAL LABORATORIES, INC.

LEAD IN PAINT - FLAME AAS (EPA 7420)

1033

PROJECT:

393 13TH STREET

Micro Log In **65948**
Total Samples 3
Date Sampled 12/01/2004
Date Received 12/01/2004
Date Analyzed 12/02/2004

County of Alameda - GSA
Engineering & Environmental
Management Department
1401 Lakeside Drive, Suite 1115
Oakland, CA 94612

Sample ID	Lead Concentration Weight Percent	mg/kg (ppm)	Reporting Limits
Client: 041201-01P Lab: 65948-01 PAINT CHIP GREEN COLOR ROOF	0.05%	502	0.008 % 82 mg/kg
Client: 041201-02P Lab: 65948-02 PAINT CHIP GREEN COLOR ROOF	0.05%	509	0.005 % 46 mg/kg
Client: 041201-03P Lab: 65948-03 PAINT CHIP GREEN COLOR UPPER ROOF	< 0.01%	< 50	0.005 % 50 mg/kg

Technical Supervisor: Tess Tagorda 12/2/2004
Tess Tagorda, Chemistry Supervisor — Date Reported

Analyst: JS/TT

AIHA ELLAP Accredited Laboratory, ID #101768. Samples are analyzed by Flame Atomic Absorption Spectrometry (AAS). U.S. EPA SW-846 Method 7420 is used for the instrumental analysis. Nitric acid and hydrogen peroxide digestion procedures are based on ASTM E-1645. This report must not be reproduced except in full, with the approval of Micro Analytical Laboratories, Inc., and pertains only to the samples analyzed. Unit explanations: mg = milligrams; kg = kilograms; ppm = parts per million. N/A = Not Applicable.

COUNTY OF ALAMEDA, GSA-TSD
1401 LAKESIDE DRIVE, RM. 1115
OAKLAND, CA 94612

Contact: Jason Garrison
Analysis Type: AAS For Lead
TAT: 65948 hr 12hr (24hr) 48hr >48hr

FACILITY NAME	393 13th st - Fox	BLDG. NO.	
FACILITY ADDRESS			
SAMPLE TAKEN BY	Jason Garrison	DATE	12/1/04

SAMPLE NUMBER (Bldg # - yymmdd - #)*	041201-01P	MATERIAL TYPE	paint chip		
01 MATERIAL DESC.	SIZE		COLOR	green	
SAMPLE LOCATION	FLOOR		ROOM NO.	AREA	roof

SAMPLE NUMBER	041201-02P	MATERIAL TYPE	paint chip		
02 MATERIAL DESC.	SIZE		COLOR	green	
SAMPLE LOCATION	FLOOR		ROOM NO.	AREA	roof

SAMPLE NUMBER	041201-03P	MATERIAL TYPE	paint chip		
03 MATERIAL DESC.	SIZE		COLOR	green	
SAMPLE LOCATION	FLOOR		ROOM NO.	AREA	Upper roof

RELINQUISHED BY	Jason B. Garrison	DATE/TIME	12/1/04
RECEIVED BY		DATE/TIME	12-1-04 14:29

Distribution:
1) Lab
2) GSA-TSD QIC 26023
3) Retain One Copy for your files

Lab must submit this form and test results to GSA-TSD,. 1401 Lakeside Dr., 11th Floor Oakland, CA 94612, attn: Jason Garrison, Before invoice will be paid.

* - Sample numbers are generated by Building Number followed by the date, year, month, day, and then sample number. For example, a sample collected from Building 1901 on April 30, 1999, would be numbered 1901-990430-01. Please adhere to this numbering method. For samples other than asbestos, insert a sample type indicator after the date and before the sample number. For example 1901-990430-Pb-01, would be a lead sample.

DOCUMENT 00 73 73.01

PUBLIC ART PROGRAM

PART 1 - GENERAL

1.01 SUMMARY

A. Document Includes:
1. This Document describes requirements for the furnishing and installation of Public Art (Artwork) by the Owner, which has been designated for the Project and required by Alameda County's Public Art Program as identified in County Ordinance 94-16 which requires the inclusion of public art in building projects.
2. County Project Manager shall represent the County and the Alameda County Arts Commission (ACAC).
3. The Alameda County Arts Commission, a division of the County of Alameda, is required by the County's Public Art Ordinance to administer the Public Art Program following the County's rules and procedures and in cooperation with the General Services Agency and the County Project Manager for installation of Artwork upon Contractors completed work.

B. Related Sections:
1. Section 01 32 16 – Progress Schedules
2. Section 09 29 00 – Gypsum Board

1.02 STATUTORY REQUIREMENTS

A. Any substantive changes to the Artwork locations, Artwork materials, or other information pertaining to the Artwork described in this section or related sections must be evaluated by the Alameda County Arts Commission.

1.03 DEFINITIONS

A. General: The Artwork has been defined as items which are part of Owner-Furnished / Owner-Installed (OF/OI) Scope of Work.

B. OF/OI:
1. Contractor shall be responsible for coordinating and scheduling the installation of OF/OI items by the Owner.
2. Owner will be responsible for timely delivery and installation of items.
3. Contractor shall be responsible for providing a clear staging and work area for the installation of OF/OI items, and shall be responsible for the protection of OF/OI items during and following installation until date of Final Completion.
4. Owner will provide scaffolding with head height clearance of 7'-0" A.F.F, where access to adjacent areas is needed.

C. Arts Commission: The Alameda County Arts Commission (ACAC) is a division of the County of Alameda. This division is responsible for the administration of the County's

Public Art Program, will oversee a design contract(s) with the artist(s) (Artist) installation of Artwork for this Project, and work directly through the County's Project Manager.

1.04 SUMMARY OF ARTWORK ITEMS

A. Wall Artwork
1. Responsibility: OF/OI
2. Location: See Sheets 13/A7.5 and A2.2
3. Description: Painted mural or light-weight wall-mounted artwork.
4. It will be the responsibility of the Contractor to coordinate with fire, life-safety, accessibility, signage, and other wall-mounted equipment to ensure that the areas identified for Wall Artwork are clear of other equipment.
5. Work space shall be directly in front of wall as indicated on Elevation 13/ A7.5

1.05 QUALITY ASSURANCE

A. Contractor shall not perform any work directly related to the Public Art Program without prior approval by the County's Project Manager.

PART 2 – PRODUCTS – Not Used

PART 3 – EXECUTION

3.01 SCHEDULE

A. Arts Coordination Meeting: The purpose of the meeting is to coordinate the activities and define roles of all the participants for the installation of Artwork.

B. Identify Artwork OF/OI Items on the progress schedule.

C. Wall Artwork (OF/OI)
1. Contractor shall provide no less than a 60-day notice to County Project Manager stating an area for Artwork is ready Arts Commission and Artist(s) to begin work on-site.
2. Pre-Construction Meeting: This meeting will be held prior to start of Artist(s) work on-site which shall include the Contractor, the County's Project Manager, a representative from the ACAC, and Artist(s). The County Project Manager will preside and issue the agenda.
3. Duration of artist(s)' work on-site will be 4 weeks.

3.02 CLEANING AND PROTECTION

A. Damage to Artwork as determined by the County Project Manager to be by the Contractor will be repaired or replaced by Contractor. The cost of such repair or replacement work shall be the responsibility of the Contractor, at no additional cost to County.

END OF DOCUMENT

DOCUMENT 01 10 00

SUMMARY OF WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents must be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions
B. Special Conditions.
C. Construction Waste Management, Document 01 35 13.26
D. LEED™ Requirements, Document 01 35 13.20
E. General Commissioning Requirements, Document 01 91 13

1.02 SUMMARY OF WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of this Contract may consist of the following:

As the needs of the IT Department have evolved over time, it has been determined that consolidation of several office locations at the Project Site would best suit its current and trending needs. The Work will entail major Tenant Improvements including but not limited to demolition and re-building of offices and associated office spaces, re-building of all HVAC, power, walls, ceilings, lighting, telecommunications, equipment and new finishes. Electrical and technology infrastructure upgrades will also be required to support the newly renovated building and consolidation of staff. The work will also include the upgrade of existing bathrooms on three floors and the construction of new bathrooms on two floors. Exterior work includes but is not limited to waterproofing at sidewalk, entries, exterior walls, roofing repair and concrete spall repair work.

1.03 CONTRACTS

A. Perform the Work under a single, fixed-price Contract.

B. Any bid item may be deleted in total or in part prior to or after award of Contract without compensation in any form or adjustment of other bid items or prices.

1.04 WORK BY OTHERS

A. Work on the Project that will be performed and completed prior to the start of the Work of this Contract: **None.**

B. Work on the Project that will be performed by others concurrent with the Work of this Contract:

(1) Elevator refurbishment – ThyssenKrupp.
(2) Flagpole refurbishment – GSA/Building Maintenance Department.
(3) Public Art – may commence during the period from Punch List to Final Completion.
(4) Hardware/Security/Entry Programming – Acme.
(5) Furniture, Fixtures and Equipment – KBM Workspace.
(6) Fiber Optics & related Telecommunications – ITD and AT&T.

1.05 CODES, REGULATIONS, AND STANDARDS

A. The codes, regulations, and standards adopted by the state and federal agencies having jurisdiction shall govern minimum requirements for this project. Where codes, regulations, and standards conflict with the Contract Documents, these conflicts shall be brought to the immediate attention of the County and the Architect.

B. Codes, regulations, and standards shall be as published effective as of date of bid opening, unless otherwise specified or indicated.

1.06 PROJECT RECORD DOCUMENTS:

A. Contractor shall maintain on Site one set of the following record documents; Contractor shall record actual revisions to the Work:

Contract Drawings.
Specifications.
Addenda.
Change Orders and other modifications to the Contract.
Reviewed shop drawings, product data, and samples.
Field test records.
Inspection certificates.
Manufacturer's certificates.

A. Contractor shall store Record Documents separate from documents used for construction. Provide files, racks, and secure storage for Record Documents and samples.

B. Contractor shall record information concurrent with construction progress.

C. Specifications: Contractor shall legibly mark and record at each product section of the Specifications the description of the actual product(s) installed, including the following:

(1) Manufacturer's name and product model and number.

(2) Product substitutions or alternates utilized.

(3) Changes made by Addenda and Change Orders and written directives.

1.07 EXAMINATION OF EXISTING CONDITIONS

A. The Contractor shall be held to have examined the Project Site and acquainted itself with the conditions of the Site or of the streets or roads approaching the Site.

B. Prior to commencement of Work, Contractor shall survey the Site and existing buildings and improvements to observe existing damage and defects such as cracks, sags, broken, missing or damaged glazing, other building elements and Site improvements, and other damage.

C. Should Contractor observe cracks, sags, and other damage to and defects of the Site and adjacent buildings, paving, and other items not indicated in the Contract Documents, Contractor shall immediately report same to the County and the Architect.

1.08 CONTRACTOR'S USE OF PREMISES

A. If unoccupied and only with County's prior written approval, Contractor may use the building(s) at the Project Site without limitation for its operations, storage, and office facilities for the performance of the Work. If the County chooses to beneficially occupy any building(s), Contractor must obtain the County's written approval for Contractor's use of spaces and types of operations to be performed within the building(s) while so occupied. Contractor's access to the building(s) shall be limited to the areas indicated.

B. If the space at the Project Site is not sufficient for Contractor's operations, storage, office facilities and/or parking, Contractor shall arrange and pay for any additional facilities needed by Contractor.

C. Contractor shall not interfere with use of or access to occupied portions of the building(s) or adjacent property.

D. Contractor shall maintain corridors, stairs, halls, and other exit-ways of building clear and free of debris and obstructions at all times.

E. No one other than those directly involved in the demolition and construction, or specifically designated by the County or the Architect shall be permitted in the areas of work during demolition and construction activities.

F. The Contractor shall install the construction security fence and maintain that it will be locked when not in use. Keys to this fencing will be provided to the County.

1.09 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

A. The Drawings show above-grade and below-grade structures, utility lines, and other installations that are known or believed to exist in the area of the Work. Contractor shall locate these existing installations before proceeding with excavation and other operations that could damage same; maintain them in service, where appropriate; and repair damage to them caused by the performance of the Work. Should damage occur to these existing installations, the costs of repair shall be at the Contractor's expense and made to the County's satisfaction.

B. Contractor shall be alert to the possibility of the existence of additional structures and utilities. If Contractor encounters additional structures and utilities, Contractor will immediately report to the County for disposition of same as indicated in the General Conditions.

C. Contract shall employ utility locating services to locate any underground utilities within the limits of work prior to the start of any excavating work. Contractor shall subsequently be responsible for repairs of any located underground utilities damaged by construction activities.

1.10 UTILITY SHUTDOWNS AND INTERRUPTIONS

A. Contractor shall give the County a **minimum of three (3) days written notice in advance of any need to shut off existing utility services** or to effect equipment interruptions. The County will set exact time and duration for shutdown, and will assist Contractor with shutdown. Work required to re-establish utility services shall be performed by the Contractor.

B. Contractor shall obtain County's written approval as indicated in the General Conditions in advance of deliveries of material or equipment or other activities that may conflict with County's use of the building(s) or adjacent facilities.

1.11 STRUCTURAL INTEGRITY

A. Contractor shall be responsible for and supervise each operation and work that could affect structural integrity of various building elements, both permanent and temporary.

B. Contractor shall include structural connections and fastenings as indicated or required for complete performance of the Work.

1.12 WORK SEQUENCE

A. Contractor shall be responsible for compliance with all requirements outlined in the hazardous materials sections of the Contract Documents.

B. Construct Work in stages and at times to accommodate County operation requirements during the construction period; coordinate construction schedule and operations with the County.

C. Phasing Schedule included in item 1.13 must be adhered to. Moving dates are included in the Phasing Schedule to show planned windows for relocation of building occupants. Liquidated damages may be assessed as described in the Contract Documents for failure to achieve milestone dates.

D. This facility may be occupied during construction. In that case: County will provide contractor with schedule of uses; at the site during the construction period; Contractor is to coordinate work with the County and maintain safe access to all buildings at all times and to not disrupt ongoing uses. Contractor must comply with the following requirements:

(1) If Contractor must shut down power to any part of the site, Contractor must provide temporary power for that section of the site.

(2) Scope of work includes utility and systems upgrade and replacement that may impact the entire site. Work must be coordinated so that site-wide systems remain functional at all times until new systems work is complete and tested.

1.13 PHASING SCHEDULE

No.	Milestones	Start	Complete
1	Contract Duration	6/20/2017	4/2/2018
2	Notice to Proceed	7/06/2017	7/06/2017
3	Last Day to Submit Construction Schedule and other documents per the Notice To Proceed	7/20/2017	7/20/2017
4	County reviews Contractor's Notice To Proceed document deliverables and Contractor's Construction Schedule	7/21/2017	7/25/2017
5	County accepts Contractor's Construction Schedule – County issues Contractor Notice to Start Construction	7/26/2017	7/26/2017
6	Construction Start Date	7/31/2017	7/31/2017
7	Construction Completion Date/Final Completion Date	4/2/2018	4/2/2018

A. The "Start" dates included in the phasing schedule indicate the date that work is to begin on the identified milestone scope of work.

B. The "Complete" dates included in the phasing schedule indicates that the following must be complete:
   (1) The entire scope of work for the milestone work must be complete, including all utility work up to the building and all final termination and operation of all building systems.
   (2) Fire alarm, telephone, data, public address and all other systems final connections must be complete and systems programmed and tested so that fully functional systems are provided.
   (3) All punch list work must be complete.
   (4) Maintenance and Operations Manuals must be submitted to the County.
   (5) All required testing must be complete.
   (6) All training for all building systems must be complete.
   (7) A minimum of six (6) keys for each and every lock must be provided. Where fewer keys are specified elsewhere in the Contract Documents, provide a minimum of 6 keys. All keys must be permanently stamped with three (3) characters identification as directed by the County.

C. Record Documents for the scope of work of each Milestone included in the Phasing Schedule must be submitted **within one week after completion of the Milestone**. AutoCAD files and PDF files to be provided at Final Contract Completion

D. Notice to proceed date is the anticipated date of issuance of the Notice to Proceed. If the Notice to Proceed is issued after the date indicated in the Phasing schedule, the start and completion dates of Milestone No. 3 through No. 7 will be adjusted by the number of days that the Notice to Proceed is delayed.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

DOCUMENT 01 22 00

UNIT PRICES AND ALTERNATES

PART I – ALTERNATES

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions;
B. Special Conditions;
C. Bid Form;
D. Instruction to Bidders.

1.02 DESCRIPTION

The items of work indicated below propose modifications to, substitutions for, additions to and/or deletions from the various parts of the Work specified in other Sections of the Specifications. The acceptance or rejection of any of the alternates is strictly at the option of the County subject to County's acceptance of Contractor's stated prices contained in this Proposal.

1.03 GENERAL

Where an item is omitted, or scope of Work is decreased, all Work pertaining to the item whether specifically stated or not, shall be omitted and where an item is added or modified or where scope of Work is increased, all Work pertaining to that required to render same ready for use on the Project in accordance with the intention of the Drawings and Specifications shall be included in an agreed upon price amount.

1.04 BASE BID

The Base Bid includes all work required to construct the Project completely and in accordance with the Contract Documents.

1.05 ALTERNATES

The Alternate descriptions below are general in nature and for reference purposes only. The Contract Documents, including, without limitation, the Drawings and Specifications, must be referred to for the complete scope of Work.

A. **Additive Alternate 1 – Roofing -** Remove all existing roofing down to structural deck. Inspect and perform any repairs needed. Provide and install a new torch-applied 2-ply asphalt roof throughout and replace existing concrete pavers with new concrete pavers and add pavers at area adjacent to Break Room on 3rd Floor. See Specification Sections 07 22 16, 07 55 00, 07 55 50 and 07 61 00 under Alternate 1 Re-Roofing in the Table of Contents. All drawings, aerials and uplift calculations have been included in these specification sections.

B. **Deductive Alternate 2 – Glass Wall System -** Provide Demountable Wall System by DIRTT, Ménage 3-way Connections instead of DIRTT 3-way Mitered Spandrel connections, typical.

C. **Additive Alternate 3 – Telecom Device -** Provide streaming device at Room 228 – First Floor Large Conference Room. Streaming device identified as Add Alternate 2 in Specification Section 27 41 16, 2.04.E - Extron SMP 351

D. **Additive Alternate 4 – Wireless -** Provide wireless presentation devices and mount to Offices 415, 419 and 421, identified as Add Alternate in Specification Section 27 41 16, 2.04.I., Mersive, Solstice Pod SGE.

E. **Additive Alternate 5 – Lighting -** Provide lighting for Public Art Wall at First Floor. See Electrical Drawings.

F. **Additive Alternate 6 – Wireless** – Upgrade all wireless presentation devices as described in Specification Section 27 41 16 from Mersive, Solstice Pod SGE devices to Mersive, Solstice Pod Unlimited.

PART 2 - UNIT PRICING

2.01 GENERAL

Contractor shall completely state all required figures based on Unit Prices listed below. Where scope of Work is decreased, all Work pertaining to the item, whether specifically stated or not, shall be omitted and where scope of Work is increased, all work pertaining to that item required to render same ready for use on the Project in accordance with intention of Drawings and Specifications shall be included in an agreed upon price amount.

2.02 UNIT PRICES

Furnish unit prices for each of the named items on a square foot, lineal foot, or per each basis, as applies. Unit prices shall include all labor, materials, services, profit, overhead, insurance, bonds, taxes, and all other incidental costs of Contractor, subcontractors, and supplier(s).

No unit price items required

END OF DOCUMENT

DOCUMENT 01 31 19

PROJECT MEETINGS

PART I – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions

B. Special Conditions

1.02 PRECONSTRUCTION CONFERENCE:

The contractor shall attend a conference a the Project Site prior to the start of construction for the purpose of determining Contractor's access to, and use of the site, verifying utilities, review construction administrative procedures, and such other items as may be pertinent to the start of construction.

1.03 PROGRESS MEETINGS:

A. Construction Manager shall schedule and hold regular weekly progress meetings after a minimum of one week's prior written notice of the meeting date and time to all Invitees as indicated below.

B. Location: Contractor's field office.

C. The Contractor shall notify and invite the following entities ("Invitees"):

(1) County Representative(s).

(2) Contractor.

(3) Contractor's Project Manager.

(4) Contractor's Superintendent.

(5) Subcontractors/suppliers, as appropriate to the agenda of the meeting.

(6) Inspector of record.

(7) Construction Manager, if any.

(8) Project Manager

(9) Architect

(10) Engineer(s), if any and as appropriate to the agenda of the meeting.

(11) Others, as appropriate to the agenda of the meeting.

D. The County's, the Architect's, and/or an engineer's Consultants will attend at their discretion, in response to the agenda.

E. The County representative, the Construction Manager, and/or another County Agent shall take and distribute meeting notes to attendees and other concerned parties. If exceptions are taken to anything in the meeting notes, those exceptions shall be stated in writing to the County **within five (5) working days following County's distribution of the meeting notes.**

1.04 PRE-INSTALLATION/PERFORMANCE MEETING:

A. Contractor shall schedule a meeting prior to the start of each of the following portions of the Work: cutting and patching of plaster and roofing, and other weather-exposed and moisture-resistant products. Contractor shall invite all Invitees to this meeting, and others whose work may affect or be affected by the quality of the cutting and patching work.

B. Contractor shall review in detail prior to this meeting, the manufacturer's requirements and specifications, applicable portions of the Contract Documents, Shop Drawings, and other submittals, and other related work. At this meeting, invitees shall review and resolve conflicts, incompatibilities, or inadequacies discovered or anticipated.

C. Contractor shall review in detail Project conditions, schedule, requirements for performance, application, installation, and quality of completed Work, and protection of adjacent Work and property.

D. Contractor shall review in detail means of protecting the completed Work during the remainder of the construction period.

1.05 SPECIAL MEETINGS:

Special meetings may be requested by the County. Contractor, subcontractors, material suppliers and any other members of the project team may be required to attend.

END OF DOCUMENT

DOCUMENT 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Contractor's Submittals and Schedules, Drawings and Specifications;

B. Special Conditions.

1.02 SECTION INCLUDES:

A. Definitions:

(1) Shop Drawings and Product Data are as indicated in the General Conditions and include, but are not limited to, fabrication, erection, layout and setting drawings, formwork and falsework drawings, manufacturers' standard drawings, descriptive literature, catalogues, brochures, performance and test data, wiring and control diagrams. In addition, there are other drawings and descriptive data pertaining to materials, equipment, piping, duct and conduit systems, and methods of construction as may be required to show that the materials, equipment or systems and all positions conform to the requirement of the Contract Documents, including, without limitation, the Drawings.

(2) "Manufactured" applies to standard units usually mass-produced; "fabricated" means specifically assembled or made out of selected materials to meet design requirements. Shop Drawings shall establish the actual detail of manufactured or fabricated items, indicate proper relation to adjoining work and amplify design details of mechanical and electrical equipment in proper relation to physical spaces in the structure.

(3) Manufacturer's Instructions: Where any item of Work is required by the Contract Documents to be furnished, installed, or performed, at a minimum, in accordance with a specified product manufacturer's instructions, the Contractor shall procure and distribute copies of these to the County, the Architect, and all other concerned parties and shall

furnish, install, or perform the work, at a minimum, in accordance with those instructions.

B. Samples, Shop Drawings, Product Data, and other items as specified, in accordance with the following requirements:

(1) Contractor shall submit all Shop Drawings, Product Data, and Samples to the County, the Architect, and the Construction Manager.

(2) Contractor shall comply with all time frames herein and in the General Conditions and, in any case, shall submit required information in sufficient time to permit proper consideration and action before ordering any materials or items represented by such Shop Drawings, Product Data, and/or Samples.

(3) Contractor shall comply with all time frames herein and in the General Conditions and, in any case, **shall allow sufficient time so that no delay occurs due to required lead time in ordering or delivery** of any item to the Site. Contractor shall be responsible for any delay in progress of Work due to its failure to observe these requirements.

(4) Time for completion of Work shall not be extended on account of Contractor's failure to promptly submit Shop Drawings, Product Data, and/or Samples.

(5) Reference numbers on Shop Drawings shall have Architectural and/or Engineering Contract Drawings reference numbers for details, sections, and “cuts” shown on Shop Drawings. These reference numbers shall be in addition to any numbering system that Contractor chooses to use or has adopted as standard.

(6) When the magnitude or complexity of submittal material prevents a complete review within the stated time frame, Contractor shall make this submittal in increments to avoid extended delays.

(7) **Contractor shall certify on submittals for review that submittals conform to Contract requirements**. In event of any variance, Contractor shall specifically state in transmittal and on Shop Drawings, portions vary and require approval of a substitute. Also certify that Contractor-furnished equipment can be installed in allocated space.

(8) Unless specified otherwise, sampling, preparation of samples, and tests shall be in accordance with the latest standard of the American Society for Testing and Materials.

(9) Upon demand by Architect or County, Contractor shall submit samples of materials and/or articles for tests or examinations and consideration before Contractor incorporates same in Work. Contractor shall be solely responsible for delays due to sample(s) not being submitted in time to allow for tests. Acceptance or rejection will be expressed in writing. Work shall be equal to approved samples in every respect. Samples that are of value after testing will remain the property of Contractor.

C. Submittal Schedule:

(1) Contractor shall prepare its proposed submittal schedule that is coordinated with its proposed construction schedule and submit both to the County **within ten (10) days after the date of the Notice to Proceed**. Contractor's proposed schedules shall become the Project Construction Schedule and the Project Submittal Schedule after each is approved by the County.

(2) Contractor is responsible for all lost time should the initial submittal be rejected, marked "revised and resubmit", etc.

(3) All Submittals shall be forwarded to the County by the date indicated on the approved Submittal Schedule, unless an earlier date is necessary to maintain the Construction Schedule, in which case those Submittals shall be forwarded to the County so as not to delay the Construction Schedule.

1.03 SHOP DRAWINGS:

A. Contractor shall submit six (6) opaque reproductions. The County will review and return the reproducible copy and one (1) opaque reproduction to Contractor.

B. Before commencing installation of any Work, the Contractor shall submit and receive approval of all drawings, descriptive data, and material list(s) as required to accomplish Work.

C. Review of Shop Drawings is regarded as a service to assist Contractor and in all cases original Contract Documents shall take precedence as outlined under General Conditions.

D. No claim for extra time or payment shall be based on work shown on Shop Drawings unless the claim is (1) noted on Contractor's transmittal letter accompanying Shop Drawings and (2) Contractor has complied with all

applicable provisions of the General Conditions, including, without limitation, provisions regarding changes and payment, and all required written approvals.

E. County shall not review Shop Drawings for quantities of materials or number of items supplied.

F. County's and/or Architect's review of Shop Drawings will be general. County and/or Architect review does not relieve Contractor of responsibility for accuracy, proper fitting, construction of Work, furnishing of materials, or Work required by Contract Documents and not indicated on Shop Drawings. Shop Drawings reviewed by County and/or Architect is not to be construed as approving departures from Contract Documents.

G. Review of Shop Drawings and Schedules does not relieve Contractor from responsibility for any aspect of those Drawings or Schedules that is a violation of local, County, State, or Federal laws, rules, ordinances, or rules and regulations of commissions, boards, or other authorities or utilities having jurisdiction.

H. Before submitting Shop Drawings for review, **Contractor shall check Shop Drawings of its subcontractors for accuracy, and confirm** that all Work contiguous with and having bearing on other work shown on **Shop Drawings is accurately drawn and in conformance with Contract Documents.**

I. Submitted drawings and details must bear stamp of approval of Contractor:

(1) Stamp and signature shall clearly certify that Contractor has checked Shop Drawings for compliance with Drawings.

(2) If Contractor submits a Shop Drawing without an executed stamp of approval, or whenever it is evident (despite stamp) that Drawings have not been checked, the County and/or Architect will not consider them and will return them to the Contractor for revision and resubmission. In that event, it will be deemed that Contractor has not complied with this provision and Contractor shall bear risk of all delays to same extent as if it had not submitted any Shop Drawings or details.

J. Submission of Shop Drawings (in either original submission or when resubmitted with correction) constitutes evidence that Contractor has checked all information thereon and that it accepts and is willing to perform Work as shown.

K. **Contractor shall pay for cost of any changes in construction due to improper checking and coordination.** Contractor shall be responsible for all additional costs, including coordination. Contractor shall be responsible for costs incurred by itself, the County, the Architect, the Construction Manager, any other

Subcontractor or contractor, etc., due to improperly checked and/or coordination of submittals.

L. Shop Drawings must clearly delineate the following information:

(1) Project name and address.

(2) Architect's name and project number.

(3) Shop Drawing title, number, date, and scale.

(4) Names of Contractor, Subcontractor(s) and fabricator.

(5) Working and erection dimensions.

(6) Arrangements and sectional views.

(7) Necessary details, including complete information for making connections with other Work.

(8) Kinds of materials and finishes.

(9) Descriptive names of materials and equipment, classified item numbers, and locations at which materials or equipment are to be installed in the Work. Contractor shall use same reference identification(s) as shown on Contract Drawings.

M. Contractor shall prepare composite drawings and installation layouts when required to solve tight field conditions.

(1) Shop Drawings shall consist of dimensioned plans and elevations and must give complete information, particularly as to size and location of sleeves, inserts, attachments, openings, conduits, ducts, boxes, structural interferences, etc.

(2) Contractor shall coordinate these composite Shop Drawings and installation layouts in the field between itself and it's Subcontractor(s) for proper relationship to the Work, the work of other trades, and the field conditions. **The Contractor shall check and approve the submittal(s) before submission for final review.**

1.04 PRODUCT DATA OR NON REPRODUCIBLE SUBMITTALS:

A. Contractor shall submit manufacturer's printed literature in original form. Any fading type of reproduction will not be accepted. Contract **must submit a minimum of six (6) each, to the County**. County shall return **one (1) to the Contractor**, who shall reproduce whatever additional copies it requires for distribution.

B. Contractor shall **submit six (6) copies of a complete list of all major items** of mechanical, plumbing, and electrical equipment and materials in accordance with the approved Submittal Schedule, except as required earlier to comply with the approved Construction Schedule. Other items specified are to be submitted prior to commencing Work. Contractor shall submit items of like kind at one time in a neat and orderly manner. Partial lists will not be acceptable.

C. Submittals shall include manufacturer's specifications, physical dimensions, and ratings of all equipment. Contractor shall furnish performance curves for all pumps and fans. Where printed literature describes items in addition to that item being submitted, submitted item shall be clearly marked on sheet and superfluous information shall be crossed out. If highlighting is used, Contractor shall mark all copies.

D. Equipment submittals shall be complete and include space requirements, weight, electrical and mechanical requirements, performance data, and supplemental information that may be requested.

1.05 SAMPLES:

A. Contractor shall submit for approval Samples as required and within the time frame in the Contract Documents. Materials such as concrete, mortar, etc., which require on-site testing will be obtained from Project Site.

B. Contractor shall **submit six (6) samples** except where greater or lesser number is specifically required by Contract Documents including, without limitation, the Specifications.

(1) Samples must be of sufficient size and quality to clearly illustrate functional characteristics, with integrally related parts and attachment devices.

(2) Samples must show full range of texture, color, and pattern.

C. Contractor shall make all Submittals, unless it has authorized Subcontractor(s) to submit and Contractor has notified the County in writing to this effect.

D. Samples to be shipped prepaid or hand-delivered to the County.

E. Contractor shall mark samples to show name of Project, name of Contractor submitting, Contract number and segment of Work where representative Sample will be used, all applicable Specifications Sections and documents, Contract Drawing Number and detail, and ASTM or FS reference, if applicable.

F. Contractor shall not deliver any material to Site prior to receipt of County's and/or Architect's completed written review and approval. Contractor shall furnish materials equal in every respect to approved Samples and execute Work in conformance therewith.

G. County's and/or Architect's review, acceptance, and/or approval of Sample(s) will not preclude rejections of any material upon discovery of defects in same prior to final acceptance of completed Work.

H. After a material has been approved, no change in brand or make will be permitted.

I. Contractor shall prepare its Submittal Schedule and submit Samples of materials requiring laboratory tests to specified laboratory for testing **not less than ninety (90) days before such materials are required to be used in Work**.

J. Samples which are rejected must be resubmitted promptly after notification of rejection and be marked "Resubmitted Sample" in addition to other information required.

K. Field Samples and Mock-Ups are to be removed by Contractor at County's direction:

(1) Size: As Specified.

(2) Furnish catalog numbers and similar data, as requested.

1.06 REVIEW AND RESUBMISSION REQUIREMENTS:

A. The County will arrange for review of Sample(s), Shop Drawing(s), Product Data, and other submittal(s) by appropriate reviewer and return to Contractor as provided below **within twenty one (21) days after receipt** or within twenty one (21) days after receipt of all related information necessary for such review, whichever is later.

B. **One (1) copy of product or materials data will be returned to Contractor** with the review status.

C. Samples to be incorporated into the Work will be returned to Contractor, together with a written notice designating the Sample with the appropriate review status and indicating errors discovered on review, if any. Other Samples will not be returned, but the same notice will be given with respect thereto, and that notice shall be considered a return of the Sample.

D. Contractor shall revise and resubmit any Sample(s), Shop Drawing(s), Product Data, and other submittal(s) as required by the reviewer. Such resubmittals will be reviewed and returned in the same manner as original Sample(s), Shop Drawing(s), Product Data, and other submittal(s), **within fourteen (14) days after receipt thereof** or within fourteen (14) days after receipt of all related information necessary for such review.

E. Contractor may proceed with any of the Work covered by Sample(s), Shop Drawing(s), Product Data, and other submittal(s) upon its return if designated as no exception taken, or revise as noted, provided the Contractor proceeds in accordance with the County's and/or the Architect's notes and comments.

F. Contractor shall not begin any of the work covered by a Sample(s), Shop Drawing(s), Product Data, and other submittal(s), designated as revise and resubmit or rejected, until a revision or correction thereof has been reviewed and returned to Contractor.

G. Sample(s), Shop Drawing(s), Product Data, and other submittal(s) designated as revise and resubmit or rejected and requiring resubmittal, shall be revised or corrected and resubmitted to the County **no later than fourteen (14) days or a shorter period** as required to comply with the approved Construction Schedule, after its return to Contractor.

H. Neither the review nor the lack of review of any Sample(s), Shop Drawing(s), Product Data, and other submittal(s) shall waive any of the requirements of the Contract Documents, or relieve Contractor of any obligation thereunder.

I. County's and/or Architect's review of Shop Drawings does not relieve the Contractor of responsibility for any errors that may exist. Contractor is responsible for the dimensions and design of adequate connections and details and for satisfactory construction of all the Work.

END OF DOCUMENT

DOCUMENT 01 35 13.10

SUSTAINABLE PROJECT REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, Document 00 72 13, including, without limitation, Inspections and Tests, Uncovering of Work and Non-conforming of Work and Correction of Work;

B. Special Conditions, Document 00 73 13;

C. LEED ™ Requirements, Document 01 35 13.20;

D. Construction Waste Management, Document 01 35 13.26;

E. Indoor Air Quality (IAQ) Management, Document 01 35 46;

F. General Commissioning Requirements, Document 01 91 13.

1.02 RELATED CODES:

A. The Work is governed by requirements of Title 24, California Code of Regulations ("CCR"). The following codes are adopted under Alameda County General Ordinance No. O-2013-50:

(1) 2013 California Building Code (CA Title 24, Part 2, Volume 1 and 2); 2013 California Energy Code (Title 24, Part 6); 2013 California Historical Building Code (Title 24, Part 8); 2013 California Existing Building Code (Title 24, Part 10); 2013 California Green Building Standards Code (Title 24, Part 11) adopted as Chapter 15.08 Building Code of the County.

(2) 2013 California Electrical Code (CA Title 24, Part 3) adopted as Chapter 15.12 Electrical Code of the County.

(3) 2013 California Mechanical Code (CA Title 24, Part 4) adopted as Chapter 15.16 Mechanical Code of the County.

(4) 2013 California Plumbing Code (CA Title 24, Part 4) adopted as Chapter 15.20 Plumbing Code of the County.

1.02 SUMMARY:

A. It is the County's intent to design, construct, commission and operate its projects following integrated, sustainable design and construction principles and practices, using "green" building technologies, materials and methods. The benefits are a healthy, resource-efficient and productive work environment for the County, our surrounding community and future generations.

B. The County expects that the Contractor and its Subcontractors will effectively provide the Project's sustainable design, construction, commissioning and operational efforts to produce a functional, efficient, healthy facility, compliant with building code requirements and to achieve a minimum LEED ™ Gold Rating certification from the U.S. Green Building Council.

1.04 CONTRACTOR REQUIREMENTS:

A. Contractor is required to participate to the maximum degree possible to achieve the minimum LEED ™ Gold Rating certification as designed in the Contract Documents.

B. Contractor to identify one person on Contractor's staff to be responsible for LEED ™ and other green building compliance coordination and documentation as indicated in the Contract Documents.

C. Contract Documents are not intended to limit alternative means of achieving County's sustainable project requirements.

1.05 REFERENCES:

A. County of Alameda, Public Works Agency, 2013 Building Codes, Ordinance No. O-2013-50, found at www.acgov.org/pwa

END OF DOCUMENT

DOCUMENT 01 35 13.20

LEED™ REQUIREMENTS

PART I -- GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, Document 00 72 13, including, without limitation, Inspections and Tests, Uncovering of Work and Non-conforming of Work and Correction of Work;

B. Special Conditions, Document 00 73 13;

C. Sustainable Project Requirements, Document 01 35 13.10;

D. Construction Waste Management, Document 01 35 13.26;

E. Indoor Air Quality (IAQ) Management, Document 01 35 46;

F. General Commissioning Requirements, Document 01 91 13;

G. Summary of Work, Document 01 11 00;

H. Submittal Procedures, Document 01 33 00;

I. Definitions and Reference Standards, Document 01 42 16;

J. Quality Assurance – Materials and Equipment, Document 01 43 00;

K. Quality Control, Document 01 45 00;

L. Temporary Facilities and Controls, Document 01 50 00;

M. Product Options and Substitutions, Document 01 62 00;

N. Delivery, Storage and Handling, Document 01 65 00;

O. Divisions 02 through 29 Sections for LEED™ requirements specific to the Work of each of those Sections. These requirements may or may not include reference to LEED™.

P. Drawings apply to this Section.

1.02 SUMMARY

A. Section includes: General requirements and procedures for compliance with certain U.S. Green Building Council's (USGBC) LEED™ prerequisites and credits needed for the Project to obtain minimum LEED™ Gold Rating certification.

1. Other LEED™ prerequisites and credits needed to obtain LEED™ certification are dependent on material selections and may not be specifically identified as LEED™ requirements. Compliance with requirements needed to obtain LEED™ prerequisites and credits may be used as one criterion to evaluate substitution requests.

2. Additional LEED™ prerequisites and credits needed to obtain the indicated LEED™ certification are dependent on the Architect's design and other aspects of the Project. Architect's design has integrated requirements into the Project Contract Documents.

3. Contractor shall become familiar with and comply with these Project requirements.

4. Contractor will use the LEED ™ "Project Checklist" as developed by the Architect and the County for the Project. The Project Checklist indicates the anticipated "Points" to be met under the:

   (a) LEED v2009 (also known as LEED v3) for Commercial Interiors Rating System.

5. Project is to be submitted to the U.S. Green Building Council to attain LEED™ certification.

6. Suggestions from Contractor and its Subcontractors, suppliers, and manufacturers for implementing and attaining LEED ™ goals are encouraged; team approach is also encouraged.

1.04 DEFINITIONS

A. LEED™: Leadership in Energy & Environmental Design. LEED ™ Green Building Rating system certification is by the U.S. Green Building Council (USGBC).

B. Certificates of Chain-of-Custody: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria". Certificates shall include evidence that mill is certified for chain-of-custody by an FSC-accredited certification body.

C. Rapidly Renewable Materials: Materials made from agricultural products that are typically harvested within a ten-year or shorter cycle. Rapidly renewable materials include

products made from bamboo, cotton, flax, jute, straw, sunflower seed hulls, vegetable oils, or wool.

D. Regionally Manufactured Materials: Materials that are manufactured within a radius of 500 miles from the Project location. Manufacturing refers to the final assembly of components into the building product that is installed at the Project site.

E. Regionally Extracted, Harvested, or Recovered Materials: Materials that are extracted, harvested, or recovered and manufactured within a radius of 500 miles from the Project site.

F. Recycled Content: The percentage by weight of constituents that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer), or after consumer use (post-consumer).

1. Spills and scraps from the original manufacturing process that are combined with other constituents after a minimal amount of reprocessing for use in further production of the same product are not recycled materials.

2. Discarded materials from one manufacturing process that are used as constituents in another manufacturing process are pre-consumer recycled materials.

1.05 QUALITY ASSURANCE

A. Project Management and Coordination: Contractor to identify one person on Contractor's staff to be responsible for LEED ™ coordination and compliance.

B. Contractor to carefully review Contract Documents for LEED ™ requirements; to coordinate the work of trades, subcontractors, and suppliers; to instruct workers about compliance issues; and to perform to the Contract Documents.

1. Submittals: Contractor's staff to have experience relating to "green" building construction practices and preparation of submittals to meet LEED ™ certification requirements.

   a. Collect, compile, verify and maintain sufficient information for submittals indicating compliance with applicable LEED ™ certification requirements.

2. Meetings: Include LEED ™ requirements on the agenda at meetings. At a minimum, discuss LEED ™ goals and progress at the following meetings:

   a. Pre-construction meeting(s).
   b. Pre-installation meetings(s).
   c. Regularly scheduled job-site meetings.

1.06 SUBMITTALS

A. General: Submit LEED™ submittal requirements as specified in this section and/or included in other sections of the Contract Documents.

B. LEED™ submittals are part of and/or are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED™ requirements.

C. LEED™ submittals must be prepared and formatted to be submitted using the LEED™ Online credit website.

1. The Contractor is not responsible for obtaining project access or uploading documents to LEED™-Online.
    a. Architect will provide any credit templates to Contractor for LEED ™ submittals. Completing templates requires Adobe Reader or Professional 7.0 or higher.
    b. Each credit template is an editable Adobe pdf document.
    c. Each credit template may be completed or updated at any time prior to the LEED™ Construction Submittal.
    d. Contractor will provide additional submittal documentation and back-up as required.
    e. Contractor, Architect and County shall have a dedicated meeting to set up the process of LEED ™ submittals, documentation, and the roles and responsibilities for the Project.

D. Project Materials and Cost Data: Include specific material cost data for individual components and materials (not including labor) where required as part of LEED™ prerequisite and credit submittals. To avoid repeated calculations, cost data shall be consistent for all credits requiring similar material cost data.

E. The LEED™ 2009 for Commercial Interiors Project Checklist includes the anticipated certification Points to be achieved and the Credits are indicated below. The Project Checklist scorecard lists Points confirmed for the Project as designed, and the scorecard is at the end of this Section.
1. Sustainable Sites (SS) Credit c1 - Site Selection
2. SS c2 - Development Density and Community Connectivity
3. SS c3.1 - Alternative Transportation - Public Transportation Access
4. SS c3.2 - Alternative Transportation - Bicycle Storage and Changing Rooms
5. SS c3.3 Alternative Transportation – Parking Availability
6. Water Efficiency (WE) Prerequisite 1 - Water Use Reduction - 20% Reduction
7. WE c1 - Water Use Reduction
8. Energy and Atmosphere (EA) Prerequisite 1 – Fundamental Commissioning of Building Energy Systems
9. EA Prerequisite 2 – Minimum Energy Performance

10. EA Prerequisite 3 – Fundamental Refrigerant Management
11. EA c1.1 – Optimize Energy Performance – Lighting Power
12. EA c1.2 – Optimize Energy Performance – Lighting Controls
13. EA c1.3 – Optimize Energy Performance – HVAC
14. EA c1.4 – Optimize Energy Performance – Equipment and Appliances
15. Materials and Resources (MR) Prerequisite 1 – Storage and Collection of Recyclables
16. MR c1.2 – Building Reuse
17. MR c2 – Construction Waste Management
18. MR c4 – Recycled Content
19. MR c6 – Rapidly Renewable Materials
21. MR c7 – Certified Wood
22. Indoor Environmental Quality (IEQ) Prerequisite 1 – Minimum IAQ Performance
23. IEQ Prerequisite 2 – Environmental Tobacco Smoke (ETS) Control.
24. IEQ c1 – Outdoor Air Delivery Monitoring
25. IEQ c2 – Increased Ventilation
26. IEQ c3.1 – Construction IAQ Management Plan – During Construction
27. IEQ c3.2 – Construction IAQ Management Plan – Before Occupancy
28. IEQ c4.1 – Low-Emitting Materials – Adhesives and Sealants
29. IEQ c4.2 – Low-Emitting Materials – Paints and Coatings
30. IEQ c4.3 – Low-Emitting Materials – Flooring Systems
31. IEQ c4.4 – Low-Emitting Materials – Composite Wood and Agrifiber Products
32. IEQ c4.5 – Low-Emitting Materials – Systems Furniture and Seating
33. IEQ c5 – Indoor Chemical & Pollutant Source Control
34. IEQ c6.1 – Controllability of Systems – Lighting
35. IEQ c6.2 - Controllability of Systems – Thermal Comfort
36. IEQ c7.1 – Thermal Comfort – Design
37. IEQ c7.2 – Thermal Comfort – Verification
36. Innovation and Design (ID) Credit c2 – LEED Accredited Professional
37. Regional Priority (RP) Credit c1.1 – Alt Trans – Public Transportation Access
38. RP c1.2 – Water Reduction
39. RP c1.3 – Construction Waste Management
40. RP c1.4 – Opt Energy Performance – Lighting Power

F. LEED™ Action Plans: Provide preliminary submittals list within ten (10) days of the Notice to Proceed date indicating how the following requirements will be met:
   1. Credit MR c2: Waste management plan.
   2. Credit MR c4: List of proposed materials with recycled content.
      a. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
   3. Credit MR c6: List of proposed regionally manufactured materials and regionally extracted, harvested, or recovered materials.
      a. Identify each regionally manufactured material, its source, and cost.
      b. Identify each regionally extracted, harvested or recovered material, its source, and cost.
   4. Credit MR c7: List of proposed certified wood products.

a. Indicate each product containing certified wood, its source, and cost.
b. Include statement indicating total cost for wood-based materials used for Project, including non-rented temporary construction.

5. IEQ c4.1, c4.2, c4.3, and c4.4: List of low-emitting materials.
   a. Identify each product, and model number.
   b. Indicate VOC of each product, referenced standard or required certifications (ex. Floorscore, Green Label).

G. LEED™ Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED™ action plans for the following:

1. Credit MR c2: Construction Waste Management.

H. LEED™ Documentation Submittals:

1. Credit MR c2:
   a. Complete the construction waste calculation tables in the LEED™ credit template. The following information will be required to fill in these tables:
      1) General description of each type/category of waste generated.
      2) Location of receiving agent (recycler/landfill) for waste.
      3) Quantity of waste diverted (by category) in tons or cubic yards.
   b. Provide a narrative describing the project's construction waste management approach. The narrative should include the project's Construction Waste Management Plan. Please provide any additional comments or notes to describe special circumstances or considerations regarding the project's credit approach.

2. Credit MR c4:
   a. Complete the LEED™ credit template by providing the following information:
      1) Complete the Materials and Resources Calculator.
      2) Provide the total project materials cost.
      3) Provide a tabulation of each material used on the project that is being tracked for recycled content. The tabulation must include a description of the material, the manufacturer of the material, the product cost, the pre-consumer and/or post-consumer recycled content percentage, and the source of the recycled content data.
   b. Provide an optional narrative describing any special circumstances or considerations regarding the project's credit approach.

3. Credit MR c6: Product Data for rapidly renewable materials.
   a. Complete the LEED™ credit template by providing the following information:
      1) Complete the Materials and Resources Calculator.
      2) Provide a tabulation of each material used on the project that is being tracked as rapidly renewable material. The tabulation must include a de-

scription of the material, the manufacturer of the material, the product cost, the percent rapidly renewable, renewable material type

4. Credit MR c7: Product Data for certified wood products.
   a. Complete the LEED™ credit template by providing the following information:
      1) Complete the Materials and Resources Calculator.
      2) Provide a tabulation of each material used on the project that is being tracked as certified wood. The tabulation must include a description of the product, the manufacturer, product cost, and the percentage of new wood and FSC-Certified wood.
      1) Provide all the products (and/or components of products) vendor's Chain of Custody (COC) certification number. Each product name can then be cross-referenced with the manufacturer or vendor COC number during the LEED™ certification review. Visit www.fscus.org/green building for more information.
   b. Provide an optional narrative describing any special circumstance or considerations regarding the project's credit approach.

5. Credit IEQ c3.1:
   a. Complete the LEED™ credit template by providing the following information:
      1) Provide a copy of the project's Indoor Air Quality (IAQ) Management Plan.
      2) Provide c narrative describing the methods used to protect absorptive materials (installed or stored on-site) from moisture damage during construction and pre-occupancy phases.
      3) Confirm the moisture protection methods were employed for the project. Or provide photos to highlight the implemented construction IAQ practices.
      4) If the permanently installed air handling equipment was used during construction. List all filtration media (manufacturer, model number, MERV rating, location of installed filter) installed during construction and confirm that each unit replaced prior to occupancy.
      5) Provide occupancy date.
   b. Provide an optional narrative describing any special circumstance or non-standard approached taken by the Project.

6. Credit IEQ c3.2:
   a. Complete the LEED™ credit template by providing the following information:
      1) Provide the IAQ management plan for the project with IAQ management practices implemented during construction highlighted.
      2) Confirm the approach taken by project (pre-occupancy flush-out; flush-out with early occupancy; IAQ testing).
      2) Provide a narrative of the flush-out procedure or a copy of the project's

Indoor Air Quality Testing Report (if applicable).

b. Provide a narrative describing the project's specific flush-out procedures and/or IAQ testing process and results.

7. Credit IEQ c4.1:
   a. Complete the LEED™ credit template by providing the following information:
      1) Provide a listing of each indoor adhesive, sealant and sealant primer product used on the project. Include the manufacture's name, product name, specific VOC data (in g/L less water) for each product, and the corresponding allowable VOC from the referenced standard (listed in the LEED™-CI Reference Guide).
      2) Provide a listing of each indoor aerosol adhesive product used on the project. Include the manufacture's name, product name, specific VOC data (in g/L less water) for each product, and the corresponding allowable VOC from the referenced standard (listed in the LEED™-CI Reference Guide).
   b. Provide a narrative to describe any special circumstances or non-standard compliance path taken by the project.

8. Credit IEQ c4.2:
   a. Complete the LEED™ credit template by providing the following information:
      1) Provide a listing of each indoor paint and coating used on the project. Include the manufacturer's name, product name, specific VOC data (in g/L less water) for each product, and the corresponding allowable VOC from the referenced standard (listed in the LEED™-CI Reference Guide). Concrete, wood, bamboo, terrazzo, and cork floor finishes such as sealer, stain, and finish are to be included.
   b. Provide a narrative to describe any special circumstances or non-standard compliance path taken by the Project.

9. Credit IEQ c4.3:
   a. Complete the LEED™ credit template by providing the following information:
      1) Provide a listing of all flooring materials and finishes installed in the building interior. Confirm that the product complies with Concrete, wood, bamboo, terrazzo, and cork floor finishes such as sealer, stain, and finish are to be included.
      2) All carpet and carpet cushion installed must comply with CRI Green Label Plus Testing Program. For more information visit www.carpet-rug.org.
      3) All hard surface flooring must be certified as compliant with FloorScore.
   b. Provide a narrative to describe any special circumstances or non-standard compliance path taken by the project.

10. Credit IEQ c4.4:
    a. Complete the LEED™ credit template by providing the following information:
        1) Provide a listing of each composite wood and agrifiber product installed in the building interior. Confirm that the product does not contain any added urea-formaldehyde.
    b. Provide a narrative to describe any special circumstances or non-standard compliance path taken by the project.

11. Credit IEQ c4.5:
    a. Completion of this LEED™ credit template will be provided by others. It is to provide the following information:
        1) Provide a listing of all systems furniture manufactured, refurbished, or refinished within 1 year prior to occupancy. Include the manufacturer's name, product description, form of compliance (Greenguard, ANSI/BIFMA), the manufacturing period dates, and certification or test period dates.
        2) Provide Greenguard Indoor Air Quality certifications (if applicable) or ANSI/BIFMA testing (if applicable) details of the procedure, and calculations which must be dated and signed by an officer of the independent laboratory where the testing was conducted.
    b. Provide a narrative to describe any special circumstances or non-standard compliance path taken by the project.

1.07 SUBSTITUTIONS

A. In addition to the requirements of Document 01 62 00, the special substitution requirements described here apply only to the LEED™ certification of related materials and environmental products and procedures identified in this Section.

B. Notify County and Architect when Contractor wishes to substitute materials, equipment, or products that meet the aesthetic and programmatic intent of the Construction Documents and offer equivalent or increased environmental sensitivity to materials, equipment, or products which are specified to meet LEED™ requirements as indicated in the Construction Documents.

C. Substitutions that may affect LEED™ points and/or certification must be clearly stated as such.

D. Comply with the requirements of Document 01 62 00, with requirements for LEED™ substitution as follows:

1. A request for substitution for each product related to LEED™ will be considered. When a requested substitution is not accepted, provide specified product.

2. Submit the following for a LEED™ substitution request:
    a. Product data including manufacturers' name(s), address(es), and phone number(s).
    b. Include a copy of Material Safety Data Sheet(s) (MSDS) if applicable.
    c. Description of the differences of the proposed substitution from specified product related to LEED™ requirements. Include description of environmental advantages of proposed substitution over specified product.
    d. Identify product by Specification Section and LEED™ credit or credits applicable.
    e. List similar projects using product, dates of installation, and names of Contractor and Owner.
    f. Give itemized comparison of proposed substitution with specified material or product, listing variations, and reference Specification Section and Article number.
    h. Give cost data comparing proposed substitution with specified product and amount of net chance to Contract Sum. The cost data should be based on a life cycle analysis for each affected product including annual energy consumption and maintenance costs.
    i. State the effect of the substitution on the construction schedule and changes required in other work of materials, products or construction.

E. The Contractor is responsible for costs associated with re-submittal of all calculations and documentation of material or product substitutions that affect LEED™ prerequisites and credits referenced in this Section which apply to all credits included in the LEED™ Construction Submittal and which may apply to any credits previously submitted as part of the LEED™ Design Application Submittal for certification rating. Materials or products that do not meet these requirements should not be submitted for substitution. Substitutions of materials and products specified as part of the Contract Documents in the following areas (but not necessarily limited to these items) will require review and potential re-submittal of LEED™ Design Application Prerequisites and Credits:

1. Plumbing fixtures and controls.
2. Interior and exterior lighting systems and controls.
3. HVAC equipment, systems, and controls.
4. CO2 monitoring system.

F. Substituted materials or products shall not be ordered or installed without written acceptance by the owner.

PART 2- PRODUCTS

2.01 RECYCLED CONTENT OF MATERIALS

A. Credit MR c4: Provide building materials with recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum of 20 percent of the total cost of materials used for the Project.

1. The cost of post-consumer recycled content of an item shall be determined by dividing the weight of post-consumer recycled content in the item by the total weight of the item and multiplying by the cost of the item.
2. The cost of post-consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing the weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by the total weight of the item and multiplying by the cost of the item.
3. Do not include mechanical, electrical, and plumbing components in the calculation.
4. Recycled content of materials shall be defined according to the Federal Trade Commission's "Guide for the Use of Environmental Marketing Claims," 16 CFR 260.7 (e).

2.02 RAPIDLY RENEWABLE MATERIALS

A. Credit MR c6*:* Provide 2.5 percent of building materials (by cost) that are regionally manufactured materials.

2.03 CERTIFIED WOOD

A. Credit MR c7: Provide a minimum of 50 percent (by cost) of wood-based materials that are produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC, "Principles and Criteria V5".

1. Wood-based materials include but are not limited to the following materials when made from wood, engineered wood products, or wood-based panel products:
   a. Rough carpentry.
   b. Miscellaneous carpentry.
   c. Finish carpentry.
   d. Architectural woodwork.
   e. Wood cabinets.
   f. Non-rented temporary construction, including bracing, concrete formwork, pedestrian barriers, and temporary protection.

2.04 LOW-EMITTING MATERIALS

A. Credit IEQ c4.1: For interior applications use adhesives and sealants that comply with the limits for VOC content listed in the LEED™-CI Reference Guide.

B. Credit IEQ c4.2: For interior applications use paints and coatings that comply with the limits for VOC content listed in the LEED™-CI Reference Guide.

C. Credit IEQ c4.3: For all carpet and carpet cushion installed, materials and/or products must comply with CRI Green Label Plus Testing Program. For more information visit www.carpet-rug.org. All hard surface flooring must be certified as compliant with FloorScore.

D. Credit EQ c4.4: Do not use composite wood and agrifiber products that contain urea-formaldehyde resin.

E. Credit IEQ c4.5: Greenguard Indoor Air Quality certifications (if applicable) or ANSI/BIFMA testing (if applicable) details of the procedure, and calculations which must be dated and signed by an officer of the independent laboratory where the testing was conducted.

1.03 REFERENCES:

A. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers
   1. 52.2 - Method of Testing General Ventilation Air Cleaning Devices for removal Efficiency by Particle Size.
   2. 55 - Thermal Comfort Conditions for Human Occupancy.
   3. 62.1 - Ventilation for Acceptable IAQ.

B. ASTM - American Society for Testing and Materials
   1. E408 -Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
   2. E779 - Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.

C. CRI - Carpet and Rug Institute
   1. Green Label Plus Testing Program.

D. Energy Star
   1. Products labeled as Energy Star by the U.S. Environmental Protection Agency (EPA).

E. FSC - Forest Stewardship Council

F. Green Seal
   1. GC-03 - Anti-Corrosive Paints.
   2. GS-11 - Paints.

G. ISO - International Standards Organization
   1. 14021 - Environmental Labels.

H. USGBC - U. S. Green Building Council: www.usgbc.org.
   1. LEED™-Commercial Interiors v3, 2009, Green Building Rating System.

END OF DOCUMENT

LEED 2009 for Commercial Interiors

Project Checklist

ITD - 393 13th Street, Oakland, CA

Sustainable Sites — Possible Points: 21

Y	?	N			
1			Credit 1	Site Selection	1 to 5
6			Credit 2	Development Density and Community Connectivity	6
6			Credit 3.1	Alternative Transportation—Public Transportation Access	6
2			Credit 3.2	Alternative Transportation—Bicycle Storage and Changing Rooms	2
2			Credit 3.3	Alternative Transportation—Parking Availability	2

Water Efficiency — Possible Points: 11

Y			Prereq 1	Water Use Reduction—20% Reduction	
8			Credit 1	Water Use Reduction	6 to 11

Energy and Atmosphere — Possible Points: 37

Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
5			Credit 1.1	Optimize Energy Performance—Lighting Power	1 to 5
2			Credit 1.2	Optimize Energy Performance—Lighting Controls	1 to 3
10			Credit 1.3	Optimize Energy Performance—HVAC	5 to 10
1			Credit 1.4	Optimize Energy Performance—Equipment and Appliances	1 to 4
		5	Credit 2	Enhanced Commissioning	5
		5	Credit 3	Measurement and Verification	2 to 5
		5	Credit 4	Green Power	5

Materials and Resources — Possible Points: 14

Y			Prereq 1	Storage and Collection of Recyclables	
1			Credit 1.1	Tenant Space—Long-Term Commitment	1
		1	Credit 1.2	Building Reuse	1 to 2
2			Credit 2	Construction Waste Management	1 to 2
		1	Credit 3.1	Materials Reuse	1 to 2
		1	Credit 3.2	Materials Reuse—Furniture and Furnishings	1
2			Credit 4	Recycled Content	1 to 2
		1	Credit 5	Regional Materials	1 to 2
1			Credit 6	Rapidly Renewable Materials	1
1			Credit 7	Certified Wood	1

Indoor Environmental Quality — Possible Points: 17

Y	?	N			
Y			Prereq 1	Minimum IAQ Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1			Credit 1	Outdoor Air Delivery Monitoring	1
1			Credit 2	Increased Ventilation	1
1			Credit 3.1	Construction IAQ Management Plan—During Construction	1
1			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
1			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
1			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
1			Credit 4.5	Low-Emitting Materials—Systems Furniture and Seating	1
1			Credit 5	Indoor Chemical & Pollutant Source Control	1
1			Credit 6.1	Controllability of Systems—Lighting	1
1			Credit 6.2	Controllability of Systems—Thermal Comfort	1
1			Credit 7.1	Thermal Comfort—Design	1
1			Credit 7.2	Thermal Comfort—Verification	1
		1	Credit 8.1	Daylight and Views—Daylight	1 to 2
		1	Credit 8.2	Daylight and Views—Views for Seated Spaces	1

Innovation and Design Process — Possible Points: 6

			Credit 1.1	Innovation in Design: Specific Title	1
			Credit 1.2	Innovation in Design: Specific Title	1
			Credit 1.3	Innovation in Design: Specific Title	1
			Credit 1.4	Innovation in Design: Specific Title	1
			Credit 1.5	Innovation in Design: Specific Title	1
1			Credit 2	LEED Accredited Professional	1

Regional Priority Credits — Possible Points: 4

1			Credit 1.1	Regional Priority: Alt Trans - public transportation access	1
1			Credit 1.2	Regional Priority: Water Reduction	1
1			Credit 1.3	Regional Priority: Construction Waste Management	1
1			Credit 1.4	Regional Priority: Opt Energy Performance- lighting power	1

Total — Possible Points: 110

69		21	Total

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

DOCUMENT 01 35 13.26

CONSTRUCTION WASTE MANAGEMENT

PART 1 – GENERAL

1.01 SUMMARY

A. This section specifies the requirements for the diversion of demolition (non-hazardous) and construction debris from landfill and submittal of the Waste Management Plan.

B. Related requirements specified elsewhere include:

1. Requirements for temporary facilities and controls are indicated in Section 01500 – Temporary Facilities and Controls.

C. Performance Requirement: Divert a minimum of 65% construction and demolition (non-hazardous) debris from landfill. This project has a debris diversion goal of 75%.

1.03 DEFINITIONS

A. "Conversion Rate" means the rate set forth in the standardized Conversion Rate Table (see Page 8) approved by the County of Alameda for use in estimating the weight of materials identified in the Waste Management Plan and Waste Management Table (see Page 7).

B. "Divert" means to use material for any purpose other than disposal in a landfill or transfer facility.

C. "Good faith" shall be as defined by law.

D. "Recycling Service" means an off-site service that provides processing of material and diversion from landfill.

E. "Hauler" means the entity that transports construction and demolition debris to either a landfill or a recycling service.

1.04 QUALITY ASSURANCE

A. The Contractor shall obtain all special permits and licenses and meet all special requirements for performance and completion of the work of this section.

B. Regulatory requirements

1. Approval of the Waste Management Plan and Waste Management Table by the County of Alameda is required before beginning construction or demolition.

C. Recycling service company qualifications – any of the following:

1. Listed in the "*Recycle Where Directory*" an online database maintained by StopWaste.Org with approved recycling vendors and facilities. The "*Recycling Where Direc-*

tory" can be accessed at www.StopWaste.Org or by calling 1-877-STOPWASTE (1-877-786-7927).

2. If not listed, submit certification in writing from any recycling services that accepted the debris which will be diverted from landfill.

1.05 SUBMITTALS

A. Submit specified Waste Management Plan to indicate how waste will be diverted from landfills. Plan to include procedures and schedule for debris disposal. Submittal is required **within 7 calendar days after receipt of Notice to Proceed** and prior to any waste removal.

B. Submit certification from recycling services that are not listed in the "*Recycling Where Directory*". Written documentation must be provided identifying where the construction and demolition material is taken, what method or process is being used to recycle the material, and identifying applicable state and local permits held by the recycling service provider and recycling facility.

C. Submit completed Waste Management Plan, of this Section**, at 50 percent progress payment application and at 100 percent status report upon completion of the Work. The 100 percent status report is required before full release of retention.**

1.06 WASTE MANAGEMENT PLAN

A. Plan Development: Develop a plan for diverting the specified percentage of construction debris from landfill. The plan shall include the following:

1. Submit **within 7-calendar days after receipt of Notice to Proceed** and prior to any waste removal.

2. Propose means and methods for collecting and separating each type of debris deemed reusable or recyclable.

3. Identify the off-site recycling service and hauler of each designated debris item, who has agreed to accept and divert that item from landfill, in the proposed quantities anticipated. Schedule each item and list off-site recycling service and hauler company name, telephone number, address, and person contacted.

4. Include a "good faith" estimate of each type of construction waste, as applicable, that would be generated if no diversion methods were implemented. Submit with calculations based upon weight of each. The following items are subject to the "good faith" estimate and diversion requirement:

a. Asphalt & Concrete

b. Brick/Masonry/Tiles

c. Building Materials (doors, windows, fixtures, etc.)

d. Cardboard and other paper products

e. Carpet/Carpet Padding/Foam

f. Ceiling Tiles (acoustic)

g. Drywall

h. Electrical Components (light fixtures, cables, etc)

i. Film Plastic & Styrofoam Blocks

j. Landscape Debris (Plant & tree trimmings)

k. Mechanical Debris (ducts, controls, plumbing fixtures, etc)

l. Scrap Metal

m. Unpainted Wood and Pallets

n. Other (painted wood & drywall, roofing, etc)

o. Mixed C&D (defined as a mixture of three or more materials from construction or demolition sites that will be taken to a "qualified" facility for recycling.)

p. Trash/garbage

5. Calculate quantities, and convert volume measurements to weights in accordance with the defined Conversion Rate.

B. Plan Implementation

1. Maintain a log of each load, of each category item diverted from landfill. Log in separately the debris sent to a Class III landfill and the materials sent to recycling facilities.

a. Include in the log, type of load, load weight, name of hauling service; recycling service or landfill, and date accepted by recycling service or by landfill.

b. The County reserves the right to audit the log at any time. Contractor shall retain and provide to the County all weight tickets, copies of receipts and invoices and any other documentation related to the disposal or recycling of generated waste/debris from demolition and construction activities.

c. Units of measure: Use same units as stated in the accepted Construction Waste Management plan "good faith" estimate of construction waste that would be generated if no remedial methods were implemented.

2. Material handling

a. Separation facilities

1) Designate a specific on site area or areas to facilitate separation of materials for potential reuse, salvage, recycling, and return.

2) Keep waste bins and pile areas neat and clean. Clearly mark bins for each category of waste. Do not co-mingle non-recyclable waste with materials designated for reuse or recycling.

b. Environmental controls during handling, storage, or transport: Do not permit designated materials to become contaminated or to contaminate site or surrounding areas.

3. Training and coordination

a. Furnish copies of the Waste Management Plan to all on-site supervisors, each subcontractor, the County, and the Architect before/prior to commencement of the Work.

b. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all entities at the appropriate stages of the Project.

c. Meetings: Include Construction Waste Management on the agenda of meetings. At a minimum, discuss waste management goals and issues at the following meetings:

1) Pre-bid meeting(s).
2) Pre-construction meeting(s).
3) Regularly scheduled job-site meetings.

PART 2 - PRODUCTS

MATERIALS, EQUIPMENT AND FACILITIES

A. Furnish all materials, tools, equipment, devices, appurtenances, facilities, and services required for performing waste management of debris covered under this Section's Scope of Work.

B. Facilities authorized to accept mixed C&D waste for recycling and facilities that accept other types of waste are listed in the "Recycle Where Directory" an online database maintained by StopWaste.Org with approved recycling vendors and facilities. The "Recycling Where Directory" can be accessed at www.StopWaste.Org or by calling 1-877-STOPWASTE (1-877-786-7927).

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Perform as required in the Waste Management Plan accepted by the County.

3.02 DISPOSAL OF DEBRIS

A. Dispose of waste, trash and debris in a safe, acceptable manner, in accordance with applicable laws and ordinances and as prescribed by authorities having jurisdiction. Burying of trash and debris on the site will not be permitted.

B. Remove demolished materials from site as work progresses. Remove debris from the site so that its presence will not delay the progress of the work.

C. Debris shall be the property of the Contractor and shall be removed and disposed of in a legal manner off the County's property in accordance with the accepted Waste Management Plan described herein. Location of recycling facility or dump and length of haul shall be the Contractor's responsibility.

Waste Management Plan

Many of the materials generated from your project can be recycled. You are required to list materials that will be reused, recycled or disposed from your project.

See PART 1 – GENERAL, 1.01 SUMMARY, C. Performance Requirements.

Use **tons** to quantify total estimated waste and percentages for materials. Ask your hauler, recycler or site cleanup vendor to assist you with this plan. Receipts of all recycling and disposal must be submitted after project completion.

Project Name: **ITD Headquarters 393-13th Street Renovation**

Location: 393 – 13th Street, Oakland, CA

Type of Project: ☐ New Construction ☐ Demolition ■ Renovation

Square Footage: _____

Type of Construction (wood frame, concrete, steel, etc.): _____

Total Project Value: $_____

Company Name: _____ Contact: _____

Address: _____ Phone: _____

Recycler #1: _____ Contact: _____

Address: _____ Phone: _____

Recycler #2: _____ Contact: _____

Address: _____ Phone: _____

Recycler #3: _____ Contact: _____

Address: _____ Phone: _____

Questions? Call Alameda County Project Manager, GSA-CP.

Submit this form and the attached Waste Management table to:

Project Manager**:** **Maritza Delgadillo**

County of Alameda GSA- Capital Program

1401 Lakeside Drive, Suite 800

Oakland, CA 94612

Waste Management Plan

Project Name: **ITD Headquarters 393-13th Street Renovation**

Total Estimated Waste Generated by Project: _____tons
(Ask your hauler, recycler or site cleanup vendor to assist you. Use receipts from your previous jobs for estimates)

Complete and return within 7-calendar days after receipt of Notice to Proceed.			**Complete and return with receipts at 50% progress payment and at 100% status report.**		
Material Type	Estimated Reused/ Recycled	Estimated Disposed/ Landfilled	Actual Re-used/ Recy-cled	Actual Dis-posed/ Landfilled	Vendor or Facility Used (Destination)
Asphalt & Concrete					
Bricks/Masonry/Tiles					
Building Materials (doors, win-dows, fixtures, etc.)					
Cardboard & other paper prod-ucts					
Carpet/Carpet Padding/Foam					
Ceiling Tiles (acoustic)					
Drywall (new, unpainted)					
Electrical Components (light fixtures, cables, etc)					
Film Plastic & Styrofoam Blocks					
Landscape Debris (Plant & Tree Trimmings)					
Mechanical Debris (ducts, con-trols, plumbing fixtures, etc)					
Scrap Metal					
Unpainted Wood & Pallets					
Other (painted wood & drywall, roofing, etc.)					
Mixed C&D*					
Trash/Garbage					
TOTAL					

* Mixed C&D is defined as a mixture of three or more materials (e.g. wood, drywall, roofing, insulation, etc.) from construction or demolition sites that will be taken to a facility for recycling approved by the Alameda County Waste Management Authority.

* Recycling rates for mixed C&D debris loads vary among Recycling vendors and facilities. For the purposes of calculating your Waste Management Table, assume that 70% by weight of the *"mixed C&D debris"* are re-used/recycled and 30% are disposed/land-filled.

Did you have difficulties finding recycling vendors? ` ☐ Yes ☐ No

If the estimated amount reused/recycled is less than the 75% goal, please explain why:

_____

If the actual amount reused/recycled is less than the 75% goal, please explain why:

_____

Prepared by: _____ Date: _____

Signature: _____

Conversion Rates

The following conversion rates are estimates. The ranges vary widely, depending on how the materials are handled (compacted, loose, chipped, etc.). Use the conversion factors and receipts from previous projects to help you estimate the potential amount of materials and waste. Take into consideration the type and load of vehicles that will be used to haul the materials. Ask your hauler or recycler to assist you in estimating these numbers.

Material	**Lbs/cy**	**Tons/cy**
Asphalt	1,400 lbs/cy	0.7 tons/cy
Cardboard	100 lbs/cy	0.05 tons/cy
Concrete	2,600 lbs/cy (Sources range from 1,000 to 4,000)	1.3 tons/cy
Drywall	700 lbs/cy	0.35 tons/cy
Wood (chipped)	300 - 650 lbs/cy	0.15 – 0.3 tons/cy
Mixed C&D Debris	900 lbs/cy	0.45 tons/cy
Mixed Waste/Trash	100 - 350 lbs/cy	0.5 - 0.175 tons/cy

END OF DOCUMENT

SECTION 01 35 46

Indoor Air Quality (IAQ) MANAGEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for indoor air quality (IAQ) management during construction operations, including:
   1. Control of emissions during construction.
   2. Moisture control during construction.
   3. Procedures for testing baseline IAQ. Baseline IAQ requirements specify maximum indoor pollutant concentrations for acceptance of the facility.

B. Related Sections include:
   1. Division 01 Section "Sustainable Project Requirements"
   2. Division 01 Section "Quality Control"
   3. Divisions 02 through 13 sections for:
      a. Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used.
      b. Product data for paints and coatings used inside the weatherproofing system indicating VOC content of each product used.
      c. Product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.

1.3 DEFINITIONS

A. Definitions pertaining to sustainable development: As defined in ASTM E2114.

B. Adequate ventilation: Ventilation, including air circulation and air changes, required to cure materials, dissipate humidity, and prevent accumulation of particulates, dust, fumes, vapors, or gases.

C. Hazardous Materials: Any material that is regulated as a hazardous material in accordance with 49 CFR 173, requires a Material Safety Data Sheet (MSDS) in accordance with 29 CFR 1910.1200, or which during end use, treatment, handling, storage, transportation or disposal meets or has components which meet or have the potential to meet the definition of a Hazardous Waste in accordance with 40 CFR 261. Throughout this specification, hazardous material includes hazardous chemicals.
   1. Hazardous materials include: pesticides, biocides, and carcinogens as listed by recognized authorities, such as the Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC).

D. Indoor Air Quality (IAQ): The composition and characteristics of the air in an enclosed space that affect the occupants of that space. The indoor air quality of a space refers to the relative quality of air in a building with respect to contaminants and hazards and is determined by the level of indoor air pollution and other characteristics of the air, including those that impact thermal comfort such as air temperature, relative humidity and air speed.

E. Interior final finishes: Materials and products that will be exposed at interior, occupied spaces; including flooring, wallcovering, finish carpentry, and ceilings.

F. Packaged dry products: Materials and products that are installed in dry form and are delivered to the site in manufacturer's packaging; including carpets, resilient flooring, ceiling tiles, and insulation.

G. Wet products: Materials and products installed in wet form, including paints, sealants, adhesives, special coatings, and other materials which require curing.

1.4 QUALITY ASSURANCE

A. Inspection and Testing Lab Qualifications: Minimum of 5 years experience in performing the types of testing specified herein.

1.5 PRECONSTRUCTION

A. After award of Contract and prior to the commencement of the Work, schedule and conduct meeting with Owner and Architect to discuss the proposed IAQ Management Plan and to develop mutual understanding relative to details of environmental protection.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 IAQ MANAGEMENT OF EMISSIONS

A. During construction operations, follow the recommendations in SMACNA IAQ Guidelines for Occupied Buildings under Construction.

B. HVAC Protection:
   1. Seal return registers during construction operations.
   2. Provide temporary exhaust during construction operations
   3. To the greatest extent possible, isolate and/or shut down the return side of the HVAC system during construction. When ventilation system must be operational during construction activities, provide temporary filters.

C. Source Control: Provide low and zero VOC materials as specified.

D. Pathway Interruption: Isolate areas of work as necessary to prevent contamination of clean or occupied spaces. Provide pressure differentials and/or physical barriers to protect clean or occupied spaces.

E. Housekeeping: During construction, maintain project and building products and systems to prevent contamination of building spaces.

F. Temporary Ventilation: Provide an ACH (air changes per hour) of 1.5 or more and as follows:
   1. Provide minimum 48 hour pre-ventilation of packaged dry products prior to installation. Remove from packaging and ventilate in a secure, dry, well- ventilated space free from strong contaminant sources and residues. Provide a temperature range of 60 degrees F minimum to 90 degree F maximum continuously during the ventilation period. Do not ventilate within limits of Work unless otherwise approved by Architect.
   2. Provide adequate ventilation during and after installation of interior wet products and interior final finishes.
   3. Provide filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 as determined by ASHRAE 52.2 during construction and during Owner occupancy. Coordinate with work of Division 23, Heating Ventilating and Air Conditioning (HVAC).

G. Scheduling: Schedule construction operations involving wet products prior to packaged dry products to the greatest extent possible.

H. Flush-Out: After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total air volume of 14,000 cu.ft. of outdoor air per sq. ft. of floor area while maintaining an internal temperature of at least 60 degrees F and relative humidity no higher than 60 percent.

3.2 IAQ MOISTURE MANAGEMENT

A. Housekeeping:
   1. Keep materials dry. Protect stored on-site and installed absorptive materials from moisture damage.
   2. Verify that installed materials and products are dry prior to sealing and weatherproofing the building envelope.
   3. Install interior absorptive materials only after building envelope is sealed and weatherproofed.

B. Inspections: Document and report results of inspections; state whether or not inspections indicate satisfactory conditions.
   1. Examine materials for dampness as they arrive. If acceptable to Architect/Owner, dry damp materials completely prior to installation; otherwise, reject materials that arrive damp.
   2. Examine materials for mold as they arrive and reject materials that arrive contaminated with mold.
   3. Inspect stored and installed absorptive materials regularly for dampness and mold growth. Inspect after each rain event**.**
      a. Where stored on-site or installed absorptive materials become wet, notify Owner. Inspect for damage. If acceptable to Architect/Owner, dry completely prior to closing in assemblies; otherwise, remove and replace with new materials.

4. Basement: Monitor basement and crawlspace humidity, and dehumidify when relative humidity is greater than 85 percent for more than 2 weeks or at the first sign of mold growth.
5. Site drainage: Verify that final grades of site work and landscaping drain surface water and ground water away from the building.
6. Weather-proofing: Inspect moisture control materials as they are being installed. Include the following:
   a. Air barrier: Verify air barrier is installed without punctures and/or other damage. Verify air barrier is sealed completely.
   b. Flashing: Verify correct shingling of the flashing for roof, walls, windows, doors, and other penetrations.
   c. Insulation layer: Verify insulation is installed without voids.
   d. Roofing: In accordance with ASTM D7186 Standard Practice for Quality Assurance Observation of Roof Construction and Repair
7. Plumbing: Verify satisfactory pressure test of pipes and drains is performed before closing in and insulating lines.
8. HVAC: Inspect HVAC system to verify:
   a. condensate pans are sloped and plumbed correctly;
   b. access panels are installed to allow for inspection and cleaning of coils and ductwork downstream of coils;
   c. ductwork and return plenums are air sealed;
   d. duct insulation is installed and sealed; and
   e. chilled water line and refrigerant line insulation are installed and sealed.

C. Schedule:
   1. Schedule work such that absorptive materials, including but not limited to porous insulations, paper-faced gypsum board, ceiling tile, and finish flooring, are not installed until they can be protected from rain and construction-related water.
   2. Weather-proof as quickly as possible. Schedule installation of moisture-control materials, including but not limited to air barriers, flashing, exterior sealants and roofing, at the earliest possible time.

D. Testing for Moisture Content: Test moisture content of porous materials and absorptive materials to ensure that they are dry before sealing them into an assembly. Document and report results of testing. Where tests are not satisfactory, dry materials and retest.

E. If satisfactory results cannot be obtained with retest, remove and replace with new materials.
   1. Concrete: Moisture test prior to finish flooring application as specified in Division 09.
   2. Wood: Moisture test as per ASTM D4444 - Standard Test Methods for Use and Calibration of Hand-Held Moisture Meters; unless otherwise indicated acceptable upper limits for wood products are < 20% at center of piece; < 15% at surface.
   3. Gypsum Board, Gypsum Plaster, Insulation, and other absorptive materials: Moisture test with a Pinless Moisture Meter to assess patterns of moisture, if any.

F. Testing for Moisture Penetration:
   1. Windows: Test as per ASTM E1105 Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference; unless otherwise indicated, acceptable upper limits are no leakage for 15 minutes.
   2. Horizontal Waterproofing (not roofing): Test as per ASTM D5957 Standard Guide for Flood Testing Horizontal Waterproofing Installations; acceptable upper limits are no leakage for 15 minutes.
   3. Masonry: Test as per ASTM C1601 Standard Test Method for Field Determination of Water Penetration of Masonry Wall Surfaces; acceptable upper limits are no leakage for 15 minutes.
   4. Exterior Walls:
      a. Air tightness of the enclosure test: ASTM E779 Standard Test Method for Determining Air Leakage Rate by Fan Pressurization or ASTM E1827 Standard Test Methods for Determining Air tightness of Buildings Using an Orifice Blower Door.
      b. Water Leakage: Review as per ASTM E2128 Standard Guide for Evaluating Water Leakage of Building Walls.

G. Testing for Support of Microbial Growth: Test and report in accordance with ASTM D6329 Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers. Indicate susceptibility of product or material to colonization and amplification of microorganisms. Identify microorganisms and conditions of testing.
   1. Normal conditions: Perform testing at 35 degrees Centigrade and 50 percent relative humidity.
   2. Extreme conditions: Perform worst case scenarios screening tests by providing an atmosphere where environmental conditions may be favorable for microbial growth.
   3. Perform testing for the following:
      a. Fireproofing material on appropriate substrate.
      b. Ceiling tile.
      c. Wall covering.

END OF SECTION

DOCUMENT 01 41 00

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Obtaining of Permits and Licenses and Work To Comply With All Applicable Regulations;

B. Special Conditions;

C. Quality Control.

1.02 DESCRIPTION:

A. This section covers the general requirements for regulatory requirements pertaining to the Work and is supplementary to all other regulatory requirements mentioned or referenced elsewhere in the Contract Documents.

1.03 REQUIREMENTS OF REGULATORY AGENCIES:

A. All statutes, ordinances, laws, rules, codes, regulations, standards, and the lawful orders of all public authorities having jurisdiction of the Work, are hereby incorporated into these Contract Documents as if repeated in full herein and are intended to be included in any reference to Code or Building Code, unless otherwise specified, including, without limitation, the references in the list below. Contractor shall make available at the Site copies of all the listed documents applicable to the Work as the County and/or Architect may request, including, without limitation, applicable portions of the California Code of Regulations ("CCR").

B. Items of deferred approval shall be clearly marked on the first sheet of the Architect’s and/or Engineer's approved Drawings.

(1) Building Standards Administrative Code, Part 1, Title 24, CCR

(2) California Building Code (CBC), Part 2, Title 24, CCR;

(3) California Electrical Code (CEC), Part 3, Title 24, CCR; (National Electrical Code and California Amendments).

(4) California Mechanical Code (CMC), Part 4, Title 24, CCR; (Uniform Mechanical Code and California Amendments).

(5) California Plumbing Code (CPC), Part 5, Title 24, CCR; (Uniform Plumbing Code and California Amendments).

(6) California Fire Code (CFC), Part 9, Title 24, CCR; (Fire Plumbing Code and California Amendments).

(7) California Referenced Standards Code, Part 12, Title 24, CCR

(8) Title 19, CCR, Public Safety, State Fire Marshal Regulations.

(9) Partial List of Applicable NFPA Standards:

(a) NFPA 13 - Automatic Sprinkler System.

(b) NFPA 14 - Standpipes Systems.

(c) NFPA 17A - Wet Chemical System

(d) NFPA 24 - Private Fire Mains.

(e) (California Amended) NFPA 72 - National Fire Alarm Codes.

(f) NFPA 253 - Critical Radiant Flux of Floor Covering System.

(g) FPA 2001 - Clean Agent Fire Extinguishing Systems.

END OF DOCUMENT

DOCUMENT 01 42 13

ABBREVIATIONS AND ACRONYMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions including without limitation, Definitions

B. Special Conditions

1.02 DOCUMENT INCLUDES:

A. Abbreviations used throughout the Contract Documents.

B. Reference to a technical society, organization, or body is by abbreviation, as follows:

1.	AA	Aluminum Association
2.	AAMA	Architectural Aluminum Manufacturers Association
3.	AASHTO	American Association of State Highway and Transportation Officials
4.	ABPA	Acoustical and Board Products Association
5.	ACI	American Concrete Institute
6.	AGA	American Gas Association
7.	AGC	Associated General Contractors
8.	AHC	Architectural Hardware Consultant
9.	AI	Asphalt Institute
10.	AIA	American Institute of Architects
11.	AIEE	American Institute of Electrical Engineers
12.	AISC	American Institute of Steel Construction
13.	AISI	American Iron and Steel Institute
14.	AMCA	Air Moving and Conditioning Association
15.	ANSI	American National Standards Institute
16.	APA	American Plywood Association
17.	ARI	Air Conditioning and Refrigeration Institute
18.	ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
19.	ASME	American Society of Mechanical Engineers

20.	ASSE	American Society of Structural Engineers
21.	ASTM	American Society of Testing and Materials
22.	AWPB	American Wood Preservers Bureau
23.	AWPI	American Wood preservers Institute
24.	AWS	American Welding Society
25.	AWSC	American Welding Society Code
26.	AWI	Architectural Woodwork Institute
27.	AWWA	American Water Works Association
28.	BIA	Brick Institute of America
29.	CCR	California Code of Regulations
30.	CLFMI	Chain Link Fence Manufacturers Institute
31.	CMG	California Masonry Guild
32.	CRA	California Redwood Association
33.	CRSI	Concrete Reinforcing Steel Institute
34.	CS	Commercial Standards
35.	CSI	Construction Specifications Institute
36.	CTI	Cooling Tower Institute
37.	FGMA	Flat Glass Manufacturer's Association
38.	FIA	Factory Insurance Association
39.	FM	Factory Mutual
40.	FS	Federal Specification
41.	FTI	Facing Title Institute
42.	GA	Gypsum Association
43.	ICBO	International Conference of Building Officials
44.	IEEE	Institute of Electrical and Electronic Engineers
45.	IES	Illumination Engineering Society
46.	LIA	Lead Industries Association
47.	MIA	Marble Institute of America
48.	MLMA	Metal Lath Manufacturers Association
49.	MS	Military Specifications
50.	NAAMM	National Association of Architectural Metal Manufacturers
51.	NBHA	National Builders Hardware Association
52.	NBFU	National Board of Fire Underwriters
53.	NBS	National Bureau of Standards
54.	NCMA	National Concrete Masonry Association
55.	NEC	National Electrical Code
56.	NEMA	National Electrical Manufacturers Association
57.	NFPA	National Fire Protection Association/National Forest Products Association
58.	NMWIA	National Mineral Wool Insulation Association
59.	NTMA	National Terrazzo and Mosaic Association
60.	NWMA	National Woodwork Manufacturer's Association
61.	ORS	Office of Regulatory Services (California)

62.	OSHA	Occupational Safety and Health Act
63.	PCI	Precast Concrete Institute
64.	PCA	Portland Cement Association
65.	PDCA	Painting and Decorating Contractors of America
66.	PDI	Plumbing Drainage Institute
67.	PEI	Porcelain Enamel Institute
68.	PG&E	Pacific Gas & Electric Company
69.	PS	Product Standards
70.	SDI	Steel Door Institute; Steel Deck Institute
71.	SJI	Steel Joist Institute
72.	SSPC	Steel Structures Painting Council
73.	TCA	Tile Council of America
74.	TPI	Truss Plate Institute
75.	UBC	Uniform Building Code
76.	UL	Underwriters Laboratories Code
77.	UMC	Uniform Mechanical Code
78.	USDA	United States Department of Agriculture
79.	VI	Vermiculite Institute
80.	WCLA	West Coast Lumberman's Association
81	WCLB	West Coast Lumber Bureau
82.	WEUSER	Western Electric Utilities Service Engineering Requirements
83.	WIC	Woodwork Institute of California
84.	WPOA	Western Plumbing Officials Association

END OF DOCUMENT

DOCUMENT 01 42 16

DEFINITIONS AND REFERENCE STANDARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISION

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions including without limitation, Definitions;

B. Special Conditions;

1.02 QUALITY ASSURANCE:

A. For products or workmanship specified by association, trade, or Federal Standards, Contractor shall comply with requirements of the standard, except when more rigid requirements are specified in the Contract Documents, or are required by applicable codes.

B. Contractor shall conform to current reference standard publication date in effect on the date of bid opening.

C. Contractor shall obtain copies of standards unless specifically required not to by the Contract Documents.

D. Contractor shall maintain a copy of all standards at jobsite during submittals, planning, and progress of the specific Work, until final completion, unless specifically required not to by the Contract Documents.

E. Should specified reference standards conflict with Contract Documents, Contractor shall request clarification from the County and./or the Architect before proceeding.

F. The contractual relationship of the parties to the Contract shall not be altered from the contractual relationship as indicated in the Contract Documents by mention or inference otherwise in any referenced document.

G. Governing Codes shall be as shown in the Contract Documents including, without limitation, the Specifications.

1.03 SCHEDULE OF REFERENCES:

The following information is intended only for the general assistance of the Contractor, and the County does not represent that all of the information is current. It is the Contractor's responsibility to verify the correct information for each of the entities listed.

AA	Aluminum Association 900 19th Street NW, Suite 300 Washington, DC 20006 www.aluminum.org	202/862-5100
AABC	Associated Air Balance Council 1518 K Street, NW, Suite 503 Washington, DC 20005 www.aabchq.com	202/737-0202
AAMA	American Architectural Manufacturers Association 1827 Walden Office Sq., Suite 104 Schaumburg, IL 60173-4268 www.aamanet.org	847/303-5664
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street, Suite 249 Washington, DC 20001 www.aashto.org	202/624-5800
AATCC	American Association of Textile Chemists and Colorists P.O. Box 12215 One Davis Drive Research Triangle Park, NC 27709-2215 www.aatcc.org	919/549-8141
ACI	American Concrete Institute P.O. Box 9094 Farmington Hills, MI 48333-9094 www.aci-int.org	248/848-3700
ACPA	American Concrete Pipe Association 222 West Las Colinas Blvd., Suite 641 Irving, TX 75039-5423 www.concrete-pipe.org	972/506-7216
ADC	Air Diffusion Council	312/201-0101

	11 South LaSalle St., Suite 1400 Chicago, IL 60603	
AFPA	American Forest and Paper Association 1111 19th St., NW, Suite 800 Washington, DC 20036	202/463-2700
AGA	American Gas Association 1515 Wilson Blvd. Arlington VA 22209 www.aga.com	703/841-8400
AHA	American Hardboard Association 1210 W. Northwest Hwy Palatine, IL 60067-1897	847/934-8800
AI	Asphalt Institute Research Park Drive P.O. Box 14052 Lexington, KY 40512-4052 www.asphaltinstitute.org	606/288-4960
AIA	The American Institute of Architects 1735 New York Avenue, NW Washington, DC 20006-5292 www.aia.org	202/626-7300
AISC	American Institute of Steel Construction One East Wacker Drive, Suite 3100 Chicago, IL 60601-2001	800/644-2400
AITC	American Institute of Timber Construction 7012 S. Revere Pkwy., Suite 140 Englewood, CO 80112 www.aitc-glulam.org	303/792-9559
ALCA	Associated Landscape Contractors of America 12200 Sunrise Valley Drive, Suite 150 Reston, VA 20191 www.alca.org	703/620-6363
ALI	Associated Laboratories, Inc. P.O. Box 152837 1323 Wall St. Dallas, TX 75315	214/565-0593

ALSC	American Lumber Standards Committee P.O. Box 210 Germantown, MD 20875	301/972-1700
AMCA	Air Movement and Control Association International, Inc. 30 W. University Drive Arlington Heights, IL 60004-1893 www.amca.org	847/394-0150
ANLA	American Nursery and Landscape Association 1250 Eye Street, NW, Suite 500 Washington, DC 20005	202/789-2900
ANSI	American National Standards Institute 11 West 42nd Street, 13th Floor New York, NY 10036-8002 www.ansi.org	212/642-4900
APA	APA-The Engineered Wood Association P.O. Box 11700 Tacoma, WA 98411-0700 www.apawood.org	206/565-6600
APA	Architectural Precast Association P.O. Box 08669 Fort Myers, FL 33908-0669	941/454-6989
ARI	Air Conditioning and Refrigeration Institute 4301 Fairfax Drive, Suite 425 Arlington, VA 22203 www.ari/org	703/524-8800
ARMA	Asphalt Roofing Manufacturers Association Center Park 4041 Powder Mill Road, Suite 404 Calverton, MD 20705	301/231-9050
ASA	Acoustical Society of America 500 Sunnyside Blvd. Woodbury, NY 11797	516/576-2360

ASCE	American Society of Civil Engineers- World Headquarters 1801 Alexander Bell Drive Reston, VA 20190-4400 www.asce.org	800/548-2723 703/295-6000
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329-2305 www.ashrae.org	800/527-4723 404/636-8400
ASLA	American Society of Landscape Architects 4401 Connecticut Ave., NW, 5th Floor Washington, DC 20008-2369 www.asla.org	202/686-2752
ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017-2392 www.asme.org	800/434-2763
ASPE	American Society of Plumbing Engineers 3617 Thousand Oaks Blvd., Suite 210 Westlake, CA 91362-3649	805/495-7120
ASQC	American Society for Quality Control 611 E. Wisconsin Avenue Milwaukee, WI 53201-3005 www.asqc.org	800/248-1946 414/272-8575
ASSE	American Society of Sanitary Engineering 28901 Clemens Road Westlake, OH 44145 www.asse-plumbing.org	216/835-3040
ASTM	American Society for Testing and Materials 100 Barr Harbor Drive West Conshohocken, PA 19428-2959 www.astm.org	610/832-9500

AWCI	Association of the Wall and Ceiling Industries--International 307 E. Annandale Road, Suite 200 Falls Church, VA 22042-2433 www.awci.org	703/534-8300
AWPA	American Wood-Preservers' Association 3246 Fall Creek Highway, Suite 1900 Granbury, TX 76049-7979	817/326-6300
AWS	American Welding Society 550 NW LeJeune Road Miami, FL 33126 www.amweld.org	800/443-9373 305/443-9353
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235 www.awwa.org	800/926-7337 303/794-7711
BHMA	Builders' Hardware Manufacturers Association 355 Lexington Avenue, 17th Floor New York, NY 10017-6603	212/661-4261
CBM	Certified Ballast Manufacturers Association 1422 Euclid Avenue, Suite 402 Cleveland, OH 44115-2094	216/241-0711
CGA	Compressed Gas Association 1725 Jefferson Davis Hwy, Suite 1004 Arlington, VA 22202-4102 www.cganet.com	703/412-0900
CISCA	Ceilings & Interior Systems Construction Association 1500 Lincoln Hwy, Suite 202 St. Charles, IL 60174 www.cisca.org	630/584-1919
CISPI	Cast Iron Soil Pipe Institute 5959 Shallowford Road, Suite 419 Chattanooga, TN 37421	423/892-0137

CPSC	Consumer Product Safety Commission East West Towers 4330 East-West Hwy. Bethesda, MD 20814	800/638-2772
CPPA	Corrugated Polyethylene Pipe Association 432 N. Superior Street Toledo, OH 43604	800/510-2772 419/241-2221
CRA	California Redwood Association 405 Enfrente Drive, Suite 200 Novato, CA 94949	415/382-0662
CRI	Carpet and Rug Institute 310 S. Holiday Avenue Dalton, GA 30722-2048 www.carpet-rug.com	800/882-8846 706/278-3176
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Road Schaumburg, IL 60173-4758 www.crsi.org	847/517-1200
CTI	Ceramic Tile Institute of America 12061 W. Jefferson Blvd. Culver City, CA 90230-6219	310/574-7800
DHI	Door and Hardware Institute 14170 Newbrook Drive Chantilly, VA 20151-2223 www.dhi.org	703/222-2010
DIPRA	Ductile Iron Pipe Research Association 245 Riverchase Pkwy East, Suite O Birmingham, AL 35244	205/988-9870
DOC	Department of Commerce 14th Street and Constitution Avenue, NW Washington, DC 20230	202/482-2000
DOT	Department of Transportation 400 Seventh Street, SW Washington, DC 20590	202/366-4000
EJMA	Expansion Joint Manufacturers Association	914/332-0040

	25 N. Broadway Tarrytown, NY 10591-3201	
EPA	Environmental Protection Agency 401 M Street, SW Washington, DC 20460	202/260-2090
FCICA	Floor Covering Installation Contractors Association P.O. Box 948 Dalton, GA 30722-0948	706/226-5488
FM	Factory Mutual 1151 Boston-Providence Turnpike P.O. Box 9102 Norwood, MA 02062-9102 www.factorymutual.com	781/255-4300
FS	Federal Specifications Unit (Available from GSA) 470 East L'Enfant Plaza, SW, Suite 8100 Washington, DC 20407	202/619-8925
GA	Gypsum Association 810 First Street NE, Suite 510 Washington, DC 20002 www.usg.com	202/289-5440
GANA	Glass Association of North America 3310 SW Harrison Street Topeka, KS 66611-2279 www.glasswebsite.com/gana	913/266-7013
HMA	Hardwood Manufacturers Association 400 Penn Center Blvd., Suite 530 Pittsburgh, PA 15235-5605 www.hardwood.org	412/828-0770
HPVA	Hardwood Plywood and Veneer Association 1825 Michael Farraday Drive P.O. Box 2789 Reston, VA 22195-0789 www.hpva.org	703/435-2900
IEEE	Institute of Electrical and Electronic Engineers 345 E. 47th Street	800/678-4333 212/705-7900

	New York, NY 10017-2394 www.ieee.org	
IESNA	Illuminating Engineering Society of North America 120 Wall Street, 17th Floor New York, NY 10005-4001 www.iesna.org	212/248-5000
ITS	Intertek Testing Services P.O. Box 2040607/753-6711 3933 US Route 11 Cortland, NY 13045-7902 www.itsglobal.com	800/345-3851
LMA	Laminating Materials Association 116 Lawrence Street Hillsdale, NJ 07642-2730 www.lma.org	201/664-2700
MCAA	Mechanical Contractors Association of America 1385 Piccard Drive Rockville, MD 20850-4329	301/869-5800
ML/SFA	Metal Lath/Steel Framing Association (A Division of the NAAMM) 8 South Michigan Avenue, Suite 1000 Chicago, IL 60603	312/456-5590
MSS	Manufacturers Standardization Society for the Valve and Fittings Industry 127 Park Street, NE Vienna, VA 22180-4602	703/281-6613
NAA	National Arborist Association P.O. Box 1094603/673-3311 Amherst, NH 03031-1094 www.natlarb.com	800/733-2622
NAAMM	National Association of Architectural Metal Manufacturers 8 South Michigan Avenue, Suite 1000 Chicago, IL 60603 www.gss.net/naamm	312/782-5590
NAIMA	North American Insulation Manufacturers Association	703/684-0084

	44 Canal Center Plaza, Suite 310 Alexandria, VA 22314 www.naima.org	
NAPA	National Asphalt Pavement Association NAPA Building 5100 Forbes Blvd. Lanham, MD 20706-4413	301/731-4748
NCSPA	National Corrugated Steel Pipe Association 1255 23rd Street, NW, Suite 850 Washington, DC 20037 www.ncspa.org	202/452-1700
NEBB	National Environmental Balancing Bureau 8575 Grovemont Circle Gaithersburg, MD 20877-4121	301/977-3698
NECA	National Electrical Contractors Association 3 Bethesda Metro Center, Suite 1100 Bethesda, MD 20814-5372	301/657-3110
NEI	National Elevator Industry 185 Bridge Plaza North, Suite 310 Fort Lee, NJ 07024	201/944-3211
NEMA	National Electrical Manufacturers' Association 1300 N. 17th Street, Suite 1847 Rosslyn, VA 22209 www.nema.org	703/841-3200
NFPA	National Fire Protection Association One Batterymarch Park P.O. Box 9101 Quincy, MA 02269-9101 www.nfpa.org	800/344-3555 617/770-3000
NHLA	National Hardwood Lumber Association P.O. Box 34518 Memphis, TN 38184-0518 www.natlhardwood.org	901/377-1818
NIA	National Insulation Association 99 Canal Center Plaza, Suite 222 Alexandria, VA 22314 www.insulation.org	703/683-6422

NPA	National Particleboard Association 18928 Premiere Court Gaithersburg, MD 20879-1569 www.pbmdf.com	301/670-0604
NPCA	National Paint and Coatings Association 1500 Rhode Island Avenue, NW Washington, DC 20005-5597 www.paint.org	202/462-6272
NRCA	National Roofing Contractors Association O'Hare International Center 10255 W. Higgins Road, Suite 600 Rosemont, IL 60018-5607 www.roofonline.org	800/323-9545
NRMCA	National Ready Mixed Concrete Association 900 Spring Street Silver Spring, MD 20910 www.nrmca.org	301/587-1400
NSF	NSF International P.O. Box 130140 Ann Arbor, MI 48113-0140 www.nsf.org	313/769-8010
NUSIG	National Uniform Seismic Installation Guidelines 12 Lahoma Court Alamo, CA 94526	510/946-0135
NWWDA	National Wood Window and Door Association 1400 E. Touhy Avenue, G-54 847/299-5200 Des Plaines, IL 60018 www.nwwda.org	800/223-2301
SHA	Occupational Safety and Health Administration (U.S. Department of Labor) 200 Constitution Ave., NW Washington, DC 20210	202/219-8148
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077-1083 www.portcement.org	847/966-6200

PDCA	Painting and Decorating Contractors of America 3913 Old Lee Hwy, Suite 33-B Fairfax, VA 22030 www.pdca.com	800/332-7322 703/359-0826
PDI	Plumbing and Drainage Institute 45 Bristol Drive, Suite 101 South Easton, MA 02375	800/589-8956 508/230-3516
RFCI	Resilient Floor Covering Institute 966 Hungerford Drive, Suite 12-B Rockville, MD 20805-1714	301/340-8580
RIS	Redwood Inspection Service c/o California Redwood Association 405 Enfrente Drive, Suite 200 Novato, CA 94949-7206	415/382-0662
SDI	Steel Deck Institute P.O. Box 25 Fox River Grove, IL 60012 www.sdi.org	847/462-1930
SDI	Steel Door Institute 30200 Detroit Road Cleveland, OH 44145-1967	216/889-0010
SMA	Stucco Manufacturers Association 14006 Ventura Blvd. Sherman Oaks, CA 91403	213/789-8733
SMACNA	Sheet Metal and Airconditioning Contractors National Association, Inc. P.O. Box 221230 Chantilly, VA 20151-1209 www.smacna.org	703/803-2980

SPI	Society of the Plastics Industry, Inc. Spray Polyurethane Division 202/974-5200 1801 K Street, NW, Suite 600K Washington, DC 20006 www.socplas.org	800/951-2001
SSPC	Steel Structures Painting Council 40 24th Street, 6th Floor Pittsburgh, PA 15222-4643	412/281-2331
TCA	Tile Council of America 100 Clemson Research Blvd. Anderson, SC 29625	864/646-8453
TPI	Turfgrass Producers International 1855-A Hicks Road Rolling Meadows, IL 60008	800/405-8873 847/705-9898
UL	Underwriters Laboratories, Inc. 333 Pfingston Road 847/272-8800 Northbrook, IL 60062 www.ul.com	800/704-4050
UNI	Uni-Bell PVC Pipe Association 2655 Villa Creek Drive, Suite 155 Dallas, TX 75234 www.members.aol.com/unibell1	972/243-3902
USDA	U.S. Department of Agriculture 14th St. and Independence Ave., SW Washington, DC 20250	202/720-8732
WA	Wallcoverings Association 401 N. Michigan Avenue Chicago, IL 60611-4267	312/644-6610
WCLIB	West Coast Lumber Inspection Bureau P.O. Box 23145 Portland, OR 97281-3145	503/639-0651
WCMA	Window Covering Manufacturers Association 355 Lexington Ave., 17th Floor New York, NY 10017-6603	212/661-4261
WIC	Woodwork Institute of California P.O. Box 980247	916/372-9943

	West Sacramento, CA 95798-0247	
WLPDIA	Western Lath/Plaster/Drywall Industries Association 8635 Navajo Road San Diego, CA 92119	619/466-9070
WMMPA	Wood Moulding & Millwork Producers Association 507 First Street Woodland, CA 95695 www.wmmpa.com	800/550-7889 916/661-9591
WRI	Wire Reinforcement Institute 203 Loudoun Street, SW Leesburg, VA 20175-2718	703/779-2339
WWPA	Western Wood Products Association Yeon Building 522 S.W. 5th Avenue Portland, OR 97204-2122	503/224-3930

END OF DOCUMENT

DOCUMENT 01 43 00

QUALITY ASSURANCE - MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Purchase of Materials and Equipment;

B. Special Conditions;

C. Imported Materials Certification.

1.02 MATERIAL AND EQUIPMENT

A. Only items approved by the County and/or Architect shall be used.

B. Contractor shall submit lists of products and other product information in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.

1.03 MATERIAL AND EQUIPMENT COLORS

A. The County and/or Architect will provide a schedule of colors.

B. No individual color selections will be made until after approval of all pertinent materials and equipment and after receipt of appropriate samples in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.

C. Contractor shall request priority in writing for any item requiring advance ordering to maintain the approved Construction Schedule.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall deliver manufactured materials in original packages, containers, or bundles (with seals unbroken), bearing name or identification mark of manufacturer.

B. Contractor shall deliver fabrications in as large assemblies as practicable; where specified as shop-primed or shop-finished, package or crate as required to preserve such priming or finish intact and free from abrasion.

C. Contractor shall store materials in such a manner as necessary to properly protect them from damage. Materials or equipment damaged by handling, weather, dirt, or from any other cause will not be accepted.

D. Materials are not be acceptable that have been warehoused for long periods of time, stored or transported in improper environment, improperly packaged, inadequately labeled, poorly protected, excessively shipped, deviated from normal distribution pattern, or reassembled.

E. Contractor shall store material so as to cause no obstructions of sidewalks, roadways, and underground services. Contractor shall protect material and equipment furnished under Contract.

F. Contractor may store materials on Site with prior written approval by the County, all material shall remain under Contractor's control and Contractor shall remain liable for any damage to the materials. Should the Project Site not have storage area available, the Contractor shall provide for off-site storage at no cost to County.

G. When any room in Project is used as a shop or storeroom, the Contractor shall be responsible for any repairs, patching, or cleaning necessary due to that use. Location of storage space shall be subject to prior written approval by County.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers listed in various sections of Contract Documents are names of those manufacturers that are believed to be capable of supplying one or more of items specified therein.

B. The listing of a manufacturer does not imply that every product of that manufacturer is acceptable as meeting the requirements of the Contract Documents.

2.02 FACILITIES AND EQUIPMENT

A. Contractor shall provide, install, maintain, and operate a complete and adequate facility for handling, the execution, disposal, and distribution of material and

equipment as required for proper and timely performance of Work connected with Contract.

2.03 MATERIAL REFERENCE STANDARDS

A. Where material is specified solely by reference to "standard specifications" and if requested by County, Contractor shall submit for review data on actual material proposed to be incorporated into Work of Contract listing name and address of vendor, manufacturer, or producer, and trade or brand names of those materials, and data substantiating compliance with standard specifications.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. Where not more specifically described in any other Contract Documents, workmanship shall conform to methods and operations of best standards and accepted practices of trade or trades involved and shall include items of fabrication, construction, or installation regularly furnished or required for completion (including finish and for successful operation, as intended).

B. Work shall be executed by tradespersons skilled in their respective lines of Work. When completed, parts shall have been durably and substantially built and present a neat appearance.

3.02 COORDINATION

A. Contractor shall coordinate installation of Work so as to not interfere with installation of others. Adjustment or rework because of Contractor's failure to coordinate will be at no additional cost to County.

B. Contractor shall examine in-place work for readiness, completeness, fitness to be concealed or to receive other work, and in compliance with Contract Documents. Concealing or covering Work constitutes acceptance of additional cost which will result should in-place Work be found unsuitable for receiving other Work or otherwise deviating from the requirements of the Contract Documents.

3.03 COMPLETENESS

A. Contractor shall provide all portions of the Work, unless clearly stated otherwise, installed complete and operational with all elements, accessories, anchorages, utility connections, etc., in manner to assure well-balanced performance, in accordance with manufacturer's recommendations and by Contract Documents. For example, electric water coolers require water, electricity, and drain services;

roof drains require drain system; sinks fit within countertop, etc. Terms such as "installed complete," "operable condition," "for use intended," "connected to all utilities," "terminate with proper cap," "adequately anchored," "patch and refinish," "to match similar," should be assumed to apply in all cases, except where completeness of functional or operable condition is specifically stated as not required.

3.04 APPROVED INSTALLER OR APPLICATOR

A. Installation by a manufacturer's approved installer or applicator is an understood part of Specifications and only approved installer or applicator is to provide on-site Work where specified manufacturer has on-going program of approving (i.e. certifying, bonding, re-warranting) installers or applicators. Newly established relationships between a manufacturer and an installer or applicator that does not have other approved applicator work in progress or completed is not approved for this Project.

3.05 MANUFACTURER'S RECOMMENDATIONS

A. All installations shall be in accordance with manufacturer's published recommendations and specific written directions of manufacturer's representative. Should Contract Documents differ from recommendations of manufacturer or directions of his representative, Contractor shall analyze differences, make recommendations to the County and the Architect in writing, and shall not proceed until interpretation or clarification has been issued by the County and/or the Architect.

END OF DOCUMENT

DOCUMENT 01 45 00

QUALITY CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Inspections and Tests, Uncovering of Work and Non-conforming of Work and Correction of Work;

B. Special Conditions.

1.02 RELATED CODES:

A. The Work is governed by requirements of Title 24, California Code of Regulations ("CCR"), and the Contractor shall keep a copy of these available at the job Site for ready reference during construction.

1.03 OBSERVATION AND SUPERVISION:

The County and Architect or their appointed representatives will review the Work and the Contractor shall provide facilities and access to the Work at all times as required to facilitate this review. Administration by the Architect and any consulting Structural Engineer will be in accordance with applicable regulations.

1.04 TESTING AGENCIES:

A. Testing agencies and tests shall be in conformance with the General Documents.

B. Testing and inspection in connection with earthwork shall be under the direction of the County's consulting soils engineer, if any, referred to hereinafter as the "Soils Engineer."

C. Testing and inspection of construction materials and workmanship shall be performed by a qualified laboratory, referred to hereinafter as the "Testing Laboratory." The Testing Laboratory shall be under direction of an engineer registered in the State of California, shall conform to requirements of ASTM E329, and shall be employed by or in contract with the County.

1.05 TESTS AND INSPECTIONS:

A. The Contractor shall be responsible for notifying the Construction Manager of all required tests and inspections. Contractor shall notify the County Project Manager **forty-eight (48) hours in advance of performing any Work requiring testing or inspection**.

B. The Contractor shall provide access to Work to be tested and furnish incidental labor, equipment, and facilities to facilitate all inspections and tests.

C. The County will pay for first inspections and tests required by the "CCR", and other inspections or tests that the County and/or the Architect may direct to have made, including the following principal items:

(1) Tests and observations for earthwork and paving.

(2) Tests for concrete mix designs, including tests of trial batches.

(3) Tests and inspections for structural steel work.

(4) Field tests for framing lumber moisture content.

(5) Additional tests directed by the County that establish that materials and installation comply with the Contract Documents.

(6) Test and observation of welding and expansion anchors.

D. The County may at its discretion, pay and back charge the Contractor for:

(1) Retests or re-inspections, if required, and tests or inspections required due to Contractor error or lack of required identifications of material.

(2) Uncovering of work in accordance with Contract Documents.

(3) Testing done on weekends, holidays, and overtime will be chargeable to the Contractor for the overtime portion.

(4) Testing done off Site.

E. Testing and inspection reports and certifications:

(1) If initially received by Contractor, Contractor shall provide to each of the following a copy of the agency or laboratory report of each test or inspection or certification.

a. The County;

b. The Construction Manager, if any;

c. The Architect;

d. The Consulting Engineer, if any;

e. Other Engineers on the Project, as appropriate; and

f. The Contractor.

1.06 TYPE OF TEST AND INSPECTIONS (As Applies to the Project):

A. See Specifications for required tests and inspections.

END OF DOCUMENT

DOCUMENT 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions

B. Special Conditions

C. Site Standards

1.02 TEMPORARY UTILITIES:

A. Electric Power and Lighting

(1) The County will furnish and pay for power during the course of the work to the extent power is available in the building(s) or on the Site. The Contractor shall be responsible for providing temporary facilities required to deliver that power service from its existing location in the building(s) or on the Site to point of intended use.

(2) Contractor shall verify characteristics of power available in building(s) or on the Site. Contractor shall take all actions required to make modifications where power of higher voltage or different phases of current are required. Contractor shall be fully responsible for providing that service and shall pay all costs required therefor.

(3) The Contractor shall furnish, wire for, install, and maintain temporary electrical lights wherever it is necessary to provide illumination for the proper performance and/or observation of the Work: a **minimum of 20 foot-candles for rough work and 50 foot-candles for finish work.**

B. Heat and Ventilation

(1) Contractor shall provide temporary heat to maintain environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation and curing of materials, and to protect materials and finishes from damage due to improper temperature and

humidity conditions. Portable heaters shall be standard units complete with controls.

(2) Contractor shall provide forced ventilation and dehumidification, as required, of enclosed areas for proper installation and curing of materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors, and gases.

(3) Contractor shall pay the costs of installation, maintenance, operation, and removal of temporary heat and ventilation, including costs for fuel consumed, required for the performance of the Work.

C. Water

(1) The County will furnish and pay for water during the course of the work to the extent water is then available in the building(s) or on the Site. The Contractor shall be responsible for providing temporary facilities required to deliver such utility service from its existing location in the building(s) or on the Site to point of intended use.

(2) Contractor shall use backflow preventers on water lines at point of connection to County's water supply. Backflow preventers shall comply with requirements of Uniform Plumbing Code.

(3) Contractor shall make potable water available for human consumption.

D. Sanitary Facilities

(1) Contractor shall provide sanitary temporary facilities in no fewer numbers than required by law and such additional facilities as may be directed by the County for the use of all workers. The facilities shall be maintained in a sanitary condition at all times and shall be left at the Site until removal is directed by the County or Contractor completes all other work at the Site.

(2) Use of toilet facilities in the Work under construction shall not be permitted except by consent of the County.

E. Telephone Service

(1) Contractor shall arrange with local telephone service company for telephone service for the performance of the Work. Contractor shall, at a minimum, provide in its field office one line for telephone and one line for fax machine.

(2) Contractor shall pay the costs for telephone and fax lines installation, maintenance, service, and removal.

F. Fire Protection:

(1) Contractor shall provide and maintain fire extinguishers and other equipment for fire protection. Such equipment shall be designated for use for fire protection only and shall comply with all requirements of the California Fire, State Fire Marshall and/or its designee.

(2) Where on-site welding and burning of steel is unavoidable, Contractor shall provide protection for adjacent surfaces.

G. Trash Removal:

(1) See Document 01 35 13.26 Construction Waste Management.

1.03 CONSTRUCTION AIDS:

A. Plant and Equipment:

(1) Contractor shall furnish, operate, and maintain a complete plant for fabricating, handling, conveying, installing, and erecting materials and equipment; and for conveyances for transporting workmen. Include elevators, hoists, debris chutes, and other equipment, tools, and appliances necessary for performance of the Work.

(2) Contractor shall maintain plant and equipment in safe and efficient operating condition. Damages due to defective plant and equipment, and uses made thereof, shall be repaired by Contractor at no expense to the County.

B. None of the County's tools and equipment shall be used by Contractor for the performance of the Work

1.04 BARRIERS AND ENCLOSURES:

A. Contractor shall obtain the County's written permission for locations and types of temporary barriers and enclosures, including fire-rated materials proposed for use, prior to their installation.

B. Contractor shall provide and maintain temporary enclosures to prevent public entry and to protect persons using other buildings and portions of the Site and/or

Premises, the public, and workers. Contractor shall also protect the Work and existing facilities from the elements, and adjacent construction and improvements, persons, and trees and plants from damage and injury from demolition and construction operations.

C. Contractor shall provide site access to existing facilities for persons using other buildings and portions of the Site, the public, and for deliveries and other services and activities.

D. Tree and Plant Protection:

(1) Contractor shall preserve and protect existing trees and plants on the Premises that are not designated or required to be removed, and those adjacent to the Premises.

(2) Contractor shall provide barriers to a minimum height of 4'-0" around drip line of each tree and plant, around each group of trees and plants, as applicable, in the proximity of demolition and construction operations.

(3) Contractor shall not park trucks, store materials, perform Work or cross over landscaped areas. Contractor shall not dispose of paint thinners, water from cleaning, plastering or concrete operations, or other deleterious materials in landscaped areas, storm drain systems, or sewers. Plant materials damaged as a result of the performance of the Work shall, at the option of the County and at Contractor's expense, either be replaced with new plant materials equal in size to those damaged or by payment of an amount representing the value of the damaged materials as determined by the County.

(4) Contractor shall remove soil that has been contaminated during the performance of the Work by oil, solvents, and other materials which could be harmful to trees and plants, and replace with good soil, at Contractor's expense

(5) Excavation Around Trees:

(a) Excavation within drip lines of trees shall be done only where absolutely necessary and with written permission from the County.

(b) Where trenching for utilities is required within drip lines, tunneling under and around roots shall be by hand digging and shall be approved by the County. Main lateral roots and taproots shall not be cut. All roots 2 inches in diameter and larger shall be tunneled under and heavily wrapped with wet burlap so as to prevent scarring or excessive drying. Smaller roots that interfere with

installation of new work may be cut with prior approval by the County. Roots must first be cut with a Vermeer, or equivalent, root cutter prior to any trenching.

(c) Where excavation for new construction is required within drip line of trees, hand excavation shall be employed to minimize damage to root system. Roots shall be relocated in backfill areas wherever possible. If encountered immediately adjacent to location of new construction, roots shall be cut approximately 6 inches back from new construction.

(d) Approved excavations shall be carefully backfilled with the excavated materials approved for backfilling. Backfill shall conform to adjacent grades without dips, sunken areas, humps, or other surface irregularities. Do not use mechanical equipment to compact backfill. Tamp carefully using hand tools, refilling and tamping until Final Acceptance as necessary to offset settlement.

(e) Exposed roots shall not be allowed to dry out before permanent backfill is placed. Temporary earth cover shall be provided, or roots shall be wrapped with four layers of wet, untreated burlap and temporarily supported and protected from damage until permanently relocated and covered with backfill.

(f) Accidentally broken roots should be sawed cleanly 3 inches behind ragged end.

1.05 SECURITY AND PARKING:

A. The Contractor shall be responsible for project security for materials, tools, equipment, supplies, and completed and partially completed Work.

B. Contractor is responsible for any charges associated with parking of Contractor and Contractor employee's vehicles either at County facilities or off-site. Unless otherwise stated, all parking at County facilities requires payment.

1.06 TEMPORARY CONTROLS:

A. Noise Control

(1) Contractor acknowledge, that adjacent facilities may remain in operation during all or a portion of the Work period, and it shall take all reasonable precautions to minimize noise as required by applicable laws and the Contract Documents.

(2) Notice of proposed noisy operations, including without limitation, operation of pneumatic demolition tools, concrete saws, and other equipment, shall be submitted to the County a minimum of forty-eight (48) hours in advance of their performance.

B. Noise and Vibration

(1) Equipment and impact tools shall have intake and exhaust mufflers.

(2) Contractor shall cooperate with County to minimize and/or seize the use of noisy and vibratory equipment if that equipment becomes objectionable by its longevity.

C. Dust and Dirt

(1) Contractor shall conduct demolition and construction operations to minimize the generation of dust and dirt, and prevent dust and dirt from interfering with the progress of the Work and from accumulating in the Work and adjacent areas including, without limitation, occupied facilities.

(2) Contractor shall periodically water exterior demolition and construction areas to minimize the generation of dust and dirt.

(3) Contractor shall ensure that all hauling equipment and trucks carrying loads of soil and debris shall have their loads sprayed with water or covered with tarpaulins, and as otherwise required by local and state ordinance.

(4) Contractor shall prevent dust and dirt from accumulating on walks, roadways, parking areas, and planting, and from washing into sewer and storm drain lines.

D. Water

Contractor shall not permit surface and subsurface water, and other liquids, to accumulate in or about the vicinity of the Premises. Should accumulation develop, Contractor shall control the water or other liquid, and suitably dispose of it by means of temporary pumps, piping, drainage lines, troughs, ditches, dams, or other methods.

E. Pollution

(1) No burning of refuse, debris, or other materials shall be permitted on or in the vicinity of the Premises.

(2) Contractor shall comply with applicable regulatory requirements and anti-pollution ordinances during the conduct of the Work including, without limitation, demolition, construction, and disposal operations.

F. Lighting:

(1) If portable lights are used after dark, all light must be located so as not to direct light into neighboring property.

1.07 JOB SIGN(S):

A. General:

(1) If required, contractor shall provide and maintain a Project identification sign with the design, text, and colors designated by the County and/or the Architect; locate sign as approved by the County.

(2) Signs other than the specified Project sign and or signs required by law, for safety, or for egress, shall not be permitted, unless otherwise approved in advance by the County.

B. Materials:

(1) Structure and Framing: Structurally sound, new or used wood or metal; wood shall be nominal 3/4-inch exterior grade plywood.

(2) Sign Surface: Minimum 3/4-inch exterior grade plywood.

(3) Rough Hardware: Galvanized.

(4) Paint: Exterior quality, of type and colors selected by the County and/or the Architect.

C. Fabrication:

(1) Contractor shall fabricate to provide smooth, even surface for painting.

(2) Size: 4'-0" x 8'-0", unless otherwise indicated.

(3) Contractor shall paint exposed surfaces of supports, framing, and surface material with exterior grade paint: one coat of primer and one coat of finish paint.

(4) Text and Graphics: As indicated.

1.08 PUBLICITY RELEASES:

A. Contractor shall not release any information, story, photograph, plan, or drawing relating information about the Project to anyone, including press and other public communications medium, including, without limitation, on website(s).

END OF DOCUMENT

DOCUMENT 01 62 00

PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. Instructions to Bidders; Document 00 11 16

B. General Conditions, Document 00 72 13 including, without limitation, Substitutions For Specified Items;

C. Special Conditions, Document 00 73 13

D. LEED™ Requirements Document 01 35 13.20

1.02 SUBSTITUTIONS OF MATERIALS AND EQUIPMENT:

A. Catalog numbers and specific brands or trade names followed by the designation "or equal" are used in conjunction with material and equipment required by the Specifications to establish the standards of quality, utility, and appearance required. Substitutions which are equal in quality, utility, and appearance to those specified may be reviewed subject to the provisions of the General Conditions.

B. Wherever more than one manufacturer's product is specified, the first-named product is the basis for the design used in the work and the use of alternative-named manufacturers' products or substitutes may require modifications in that design. If such alternatives are proposed by Contractor and are approved by the County and/or the Architect, Contractor shall assume all costs required to make necessary revisions and modifications of the design resulting from the substitutions requested by the Contractor.

C. When materials and equipment are specified by first manufacturer's name and product number, second manufacturer's name and "or approved equal," supporting data for the second product, if proposed by Contractor, shall be submitted in accordance with the requirements for substitutions.

D. If the County and/or Architect, in reviewing proposed substitute materials and equipment, require revisions or corrections to be made to previously accepted Shop Drawings and supplemental supporting data to be resubmitted, Contractor shall promptly do so. If any proposed substitution is judged by the County and/or

Architect to be unacceptable, the specified material or equipment shall be provided.

E. Samples may be required. Tests required by the County and/or Architect for the determination of quality and utility shall be made at the expense of Contractor, with acceptance of the test procedure first given by the County.

F. In reviewing the supporting data submitted for substitutions, the County and/or Architect will use for purposes of comparison all the characteristics of the specified material or equipment as they appear in the manufacturer's published data even though all the characteristics may not have been particularly mentioned in the Contract Documents. If more than two (2) submissions of supporting data are required, the cost of reviewing the additional supporting data shall be borne by Contractor, and the County will deduct the costs from the Contract Price.

END OF DOCUMENT

DOCUMENT 01 65 00

DELIVERY, STORAGE AND HANDLING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Site Access, Conditions and Requirements;

B. Special Conditions.

1.02 PRODUCTS

A. Products are as defined in the General Conditions.

B. Contractor shall not use and/or reuse materials and/or equipment removed from existing Premises, except as specifically permitted by the Contract Documents.

C. Contractor shall provide interchangeable components of the same manufacturer, for similar components.

1.03 TRANSPORTATION AND HANDLING

A. Contractor shall transport and handle Products in accordance with manufacturer's instructions.

B. Contractor shall promptly inspect shipments to confirm that Products comply with requirements, quantities are correct, and products are undamaged.

C. Contractor shall provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.04 STORAGE AND PROTECTION

A. Contractor shall store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Contractor shall store sensitive products in weather-tight, climate controlled enclosures.

B. For exterior storage of fabricated Products, Contractor shall place on sloped supports, above ground.

C. Contractor shall provide off-site storage and protection when Site does not permit on-site storage or protection.

D. Contractor shall cover products subject to deterioration with impervious sheet covering and provide ventilation to avoid condensation.

E. Contractor shall store loose granular materials on solid flat surfaces in a well-drained area and prevent mixing with foreign matter.

F. Contractor shall provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.

G. Contractor shall arrange storage of Products to permit access for inspection and periodically inspect to assure Products are undamaged and are maintained under specified conditions.

END OF DOCUMENT

DOCUMENT 01 71 23

FIELD ENGINEERING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Site Investigation, and Soils Investigation Report;

B. Special Conditions;

C. Site-Visit Certification.

1.02 REQUIREMENTS INCLUDED:

A. Contractor shall provide and pay for field engineering services by a California-registered engineer, required for the project, including, without limitations:

(1) Survey work required in execution of the Project.

(2) Civil or other professional engineering services specified, or required to execute Contractor's construction methods.

1.03 QUALIFICATIONS OF SURVEYOR OR ENGINEERS:

A. Contractor shall only use a qualified licensed engineer or registered land surveyor, to whom County makes no objection.

1.04 SURVEY REFERENCE POINTS:

A. Existing basic horizontal and vertical control points for the Project are those designated on the Drawings.

B. Contractor shall locate and protect control points prior to starting Site Work and preserve all permanent reference points during construction. In addition Contractor shall:

(1) Make no changes or relocation without prior written notice to County and Architect.

(2) Report to County and Architect when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

(3) Require surveyor to replace Project control points based on original survey control that may be lost or destroyed.

1.05 RECORDS:

A. Contractor shall maintain a complete, accurate log of all control and survey work as it progresses.

1.06 SUBMITTALS:

A. Contractor shall submit name and address of Surveyor and Professional Engineer to County and Architect prior to its/their work on the Project.

B. On request of County and Architect, Contractor shall submit documentation to verify accuracy of field engineering work, at no additional cost to the County.

C. Contractor shall submit a certificate signed by registered engineer or surveyor certifying that elevations and locations of improvements are in conformance or nonconformance with Contract Documents.

PART 2 – PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 Contractor is responsible for meeting all applicable codes, OSHA, safety and shoring requirements.

3.02 Contractor is responsible for any re-surveying required by correction of nonconforming work.

END OF DOCUMENT

DOCUMENT 01 73 29

CUTTING AND PATCHING

1. PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions;

B. Special Conditions;

C. Hazardous Materials Procedures and Requirements;

D. Hazardous Materials Certification;

E. Imported Materials Certification.

1.02 CUTTING AND PATCHING:

A. Contractor shall be responsible for all cutting, fitting, and patching, including associated excavation and backfill, required to complete the Work or to:

(1) Make several parts fit together properly.

(2) Uncover portions of Work to provide for installation of ill-timed Work.

(3) Remove and replace defective Work.

(4) Remove and replace Work not conforming to requirements of Contract Documents.

(5) Remove Samples of installed Work as specified for testing.

(6) Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.

(7) Attach new materials to existing remodeling areas, including painting (or other finishes) to match existing conditions.

B. In addition to Contract requirements, upon written instructions from the County, Contractor shall uncover Work to provide for observations of covered Work in

accordance with the Contract Documents; remove samples of installed materials for testing as directed by County; and remove Work to provide for alteration of existing Work.

C. Contractor shall not cut or alter Work, or any part of it, in such a way that endangers or compromises the integrity of the Work, the Project, or work of others.

1.03 SUBMITTALS:

A. Prior to any cutting or alterations that may affect the structural safety of Project, or work of others, and well in advance of executing such cutting or alterations, Contractor shall submit written notice to County pursuant to the applicable notice provisions of the Contract Documents, requesting consent to proceed with the cutting or alteration, including the following:

(1) The Work of the County or other trades.

(2) Structural value or integrity of any element of Project.

(3) Integrity or effectiveness of weather-exposed or weather-resistant elements or systems.

(4) Efficiency, operational life, maintenance or safety of operational elements.

(5) Visual qualities of sight-exposed elements.

B. Contractor's Request shall also include:

(1) Identification of Project.

(2) Description of affected Work.

(3) Necessity for cutting, alteration, or excavations.

(4) Effects of Work on County, other trades, or structural or weatherproof integrity of Project.

(5) Description of proposed Work:

(a) Scope of cutting, patching, alteration, or excavation.

(b) Trades that will execute Work.

(c) Products proposed to be used.

(d) Extent of refinishing to be done.

(6) Alternates to cutting and patching.

(7) Cost proposal, when applicable.

(8) The scheduled date the Contractor intends to perform the Work and the duration of time to complete the Work.

(9) Written permission of other trades whose Work will be affected.

1.04 QUALITY ASSURANCE:

A. Contractor shall ensure that cutting, fitting, and patching shall achieve security, strength, weather protection, appearance for aesthetic match, efficiency, operational life, maintenance, safety of operational elements, and the continuity of existing fire ratings.

B. Contractor shall ensure that cutting, fitting, and patching shall successfully duplicate undisturbed adjacent profiles, materials, textures, finishes, colors, and that materials shall match existing construction. Where there is dispute as to whether duplication is successful or has been achieved to a reasonable degree, the County's decision shall be final.

1.05 PAYMENT FOR COSTS:

A. Cost caused by ill-timed or defective Work or Work not conforming to Contract Documents, including costs for additional services of the County, its consultants, including but not limited to the Construction Manager, the Architect, the Project Inspector(s), Engineers, and Agents, will be paid by Contractor and/or deducted from the Contract by the County.

B. County shall only pay for cost of Work if it is part of the original Contract Price or if a change has been made to the contract in compliance with the provisions of the General Conditions. Cost of Work performed upon instructions from the County, other than defective or nonconforming Work, will be paid by County on approval of written Change Order. Contractor shall provide written cost proposals prior to proceeding with cutting and patching.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Contractor shall provide for replacement and restoration of Work removed. Contractor shall comply with the Contract Documents and with the Industry Standard(s), for the type of Work, and the Specification requirements for each specific product involved. If not specified, Contractor shall first recommend a product of a manufacturer or appropriate trade association for approval by the County.

B. Materials to be cut and patched include those damaged by the performance of the Work.

PART 3 – EXECUTION

3.01 INSPECTION:

A. Contractor shall inspect existing conditions of the Site and the Work, including elements subject to movement or damage during cutting and patching, excavating and backfilling. After uncovering Work, Contractor shall inspect conditions affecting installation of new products.

B. Contractor shall report unsatisfactory or questionable conditions in writing to County as indicated in the General Conditions and shall proceed with Work as indicated in the General Conditions by County.

3.02 PREPARATION:

A. Contractor shall provide shoring, bracing and supports as required to maintain structural integrity for all portions of the Project, including all requirements of the Project.

B. Contractor shall provide devices and methods to protect other portions of Project from damage.

C. Contractor shall, provide all necessary protection from weather and extremes of temperature and humidity for the Project, including without limitation, any work that may be exposed by cutting and patching Work. Contractor shall keep excavations free from water.

3.03 ERECTION, INSTALLATION AND APPLICATION:

A. With respect to performance, Contractor shall:

(1) Execute fitting and adjustment of products to provide finished installation to comply with and match specified tolerances and finishes.

(2) Execute cutting and demolition by methods that will prevent damage to other Work, and provide proper surfaces to receive installation of repairs and new Work.

(3) Execute cutting, demolition excavating, and backfilling by methods that will prevent damage to other Work and damage to settlement.

B. Contractor shall employ original installer or fabricator to perform cutting and patching for:

(1) Weather-exposed surfaces and moisture-resistant elements such as roofing, sheet metal, sealants, waterproofing, and other trades.

(2) Sight-exposed finished surfaces.

C. Contractor shall execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes as shown or specified in the Contract Documents including, without limitation, the Drawings and Specifications.

D. Contractor shall fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces. Contractor shall conform to all Code requirements for penetrations or the Drawings and Specifications, whichever calls for a higher quality or more thorough requirement. Contractor shall maintain integrity of both rated and non-rated fire walls, ceilings, floors, etc.

E. Contractor shall restore Work which has been cut or removed. Contractor shall install new products to provide completed Work in accordance with requirements of the Contract Documents and as required to match surrounding areas and surfaces.

F. Contractor shall refinish all continuous surfaces to nearest intersection as necessary to match the existing finish to any new finish.

END OF DOCUMENT

DOCUMENT 01 76 00

PROTECTING INSTALLED CONSTRUCTION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions;

B. Special Conditions.

PART 2 - PRODUCTS

2.01 PRODUCTS FOR PATCHING AND EXTENDING WORK:

A. New Materials: As specified in the Contract Documents including, without limitation, in the Specifications, Contractor shall match existing products, conditions, and work for patching and extending work.

B. Type and Quality of Existing Products: Contractor shall determine by inspection, by testing products where necessary, by referring to existing conditions and to the Work as a standard.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Contractor shall verify that demolition is complete and that areas are ready for installation of new Work.

B. By beginning restoration Work, Contract or acknowledges and accepts the existing conditions.

3.02 PREPARATION:

A. Contractor shall cut, move, or remove items as necessary for access to alterations and renovation Work. Contractor shall replace and restore these at completion.

B. Contractor shall remove unsuitable material not as salvage unless otherwise indicated in the Contract Documents. Unsuitable material may include, without limitation, rotted wood, corroded metals, and deteriorated masonry and concrete. Contractor shall replace materials as specified for finished Work.

C. Contractor shall remove debris and abandoned items from all areas of the Site and from concealed spaces.

D. Contractor shall prepare surface and remove surface finishes to provide for proper installation of new Work and finishes.

E. Contractor shall close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity. Contractor shall insulate ductwork and piping to prevent condensation in exposed areas. Contractor shall insulate building cavities for thermal and/or acoustical protection, as detailed.

3.03 INSTALLATION:

A. Contractor shall coordinate Work of all alternations and renovations to expedite completion and to accommodate County occupancy.

B. Designated Areas and Finishes: Contractor shall complete all installations in all respects, including operational, mechanical work and electrical work.

C. Contractor shall remove, cut, and patch Work in a manner to minimize damage and to provide a means of restoring Products and finishes to original or specified condition.

D. Contractor shall refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.

E. Contractor shall install products as specified in the Contract Documents, including without limitation, the Specifications.

3.04 TRANSITIONS:

A. Where new Work abuts or aligns with existing, Contractor shall perform a smooth and even transition. Patched Work must match existing adjacent work in texture and appearance.

B. When finished surfaces are cut so that a smooth transition with new Work is not possible, Contractor shall terminate existing surface along a straight line at a natural line of division and make a recommendation for resolution to the County and the Architect for review and approval.

3.05 ADJUSTMENTS:

A. Where removal of partitions or walls results in adjacent spaces becoming one, Contractor shall rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.

B. Where a change of plane of 1/4 inch or more occurs, Contractor shall submit a recommendation for providing a smooth transition to the County and the Architect for review and approval.

C. Contractor shall trim existing doors as necessary to clear new floor finish and refinish trim as required.

D. Contractor shall fit Work at penetrations of surfaces.

3.06 REPAIR OF DAMAGED SURFACES:

A. Contractor shall patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.

B. Contractor shall repair substrate prior to patching finish.

3.07 CULTIVATED AREAS AND OTHER SURFACE IMPROVEMENTS:

A. Cultivated or planted areas and other surface improvements which are damaged by actions of the Contractor shall be restored by Contractor to their original condition or better, where indicated.

B. Contractor shall protect and replace, if damaged, all existing guard posts, barricades, and fences.

C. Contractor shall give special attention to avoid damaging or killing trees, bushes and/or shrubs on the Premises and/or identified the Contract Documents, including without limitation, the Drawings.

3.08 FINISHES:

A. Contractor shall finish surfaces as specified in the Contract Documents, including without limitations, the provisions of all Divisions of the Specifications.

B. Contractor shall finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, Contractor shall refinish entire surface to nearest intersections.

3.09 CLEANING:

A. Contractor shall continually clean the Site and the Premises as indicated in the Contract Documents, including without limitation, the provisions in the General Conditions and the Specifications regarding cleaning.

END OF DOCUMENT

DOCUMENT 01 77 00

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Completion of Work;

B. Special Conditions;

C. Construction Facilities and Temporary Controls.

1.02 CLOSEOUT PROCEDURES

Contractor shall comply with all closeout provisions as indicated in the General Conditions.

1.03 FINAL CLEANING

A. Contractor shall execute final cleaning prior to final inspection.

B. Contractor shall clean interior and exterior glass and surfaces exposed to view; remove temporary labels, tape, stains, and foreign substances, polish transparent and glossy surfaces, wax and polish new vinyl floor surfaces, vacuum carpeted and soft surfaces.

C. Contractor shall clean equipment and fixtures to a sanitary condition.

D. Contractor shall replace filters of operating equipment.

E. Contractor shall clean debris from roofs, gutters, down spouts, and drainage systems.

F. Contractor shall clean Site, sweep paved areas, and rake clean landscaped surfaces.

G. Contractor shall remove waste and surplus materials, rubbish, and construction facilities from the Site.

1.04 ADJUSTING

A. Contractor shall adjust operating products and equipment to ensure smooth and unhindered operation.

B. Record Documents and Shop Drawings: Contractor shall legibly mark each item to record actual construction, including:

(1) Measured depths of foundations in relation to finish floor datum.

(2) Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

(3) Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

(4) Field changes of dimension and detail.

(5) Details not on original Contract Drawings.

(6) Changes made by modification(s).

(7) References to related Shop Drawings and modifications.

C. County will provide one set of reproducible drawings to Contractor.

D. Contractor shall submit all required documents to County and/or Architect prior to or with its final Application for Payment.

1.06 INSTRUCTION OF COUNTY PERSONNEL:

A. Before final inspection, at agreed upon times, Contractor shall instruct County's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. For equipment requiring seasonal operation, Contractor shall perform instructions for other seasons within six months.

C. Contractor shall use operation and maintenance manuals as basis for instruction. Contractor shall review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

D. Contractor shall prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

E. Contractor shall use operation and maintenance manuals as basis for instruction. Contractor shall review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

1.07 SPARE PARTS AND MAINTENANCE MATERIALS:

A. Contractor shall provide products, spare parts, maintenance, and extra materials in quantities specified in the Specifications and in Manufacturer's recommendations.

B. Contractor shall provide County all required Operation and Maintenance Data.

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION Not used.

END OF DOCUMENT

DOCUMENT 01 78 23

OPERATION AND MAINTENANCE INSTRUCTIONS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Completion of the Work;

B. Special Conditions.

1.02 QUALITY ASSURANCE:

A. Contractor shall prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.03 FORMAT:

A. Contractor shall prepare data in the form of an instructional manual entitled "OPERATIONS AND MAINTENANCE MANUAL & INSTRUCTIONS" ("Manual").

B. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size. When multiple binders are used, Contractor shall correlate data into related consistent groupings.

C. Cover: Contractor shall identify each binder with typed or printed title "OPERATION AND MAINTENANCE MANUAL & INSTRUCTIONS"; and shall list title of Project and identify subject matter of contents.

D. Contractor shall arrange content by systems process flow under section numbers and sequence of Table of Contents of the Contract Documents.

E. Contractor shall provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

F. Text: The content shall include Manufacturer's printed data, or typewritten data on 24 pound paper.

G. Drawings: Contractor shall provide with reinforced punched binder tab and shall bind in with text; folding larger drawings to size of text pages.

1.04 CONTENTS, EACH VOLUME:

A. Table of Contents: Contractor shall provide title of Project; names, addresses, and telephone numbers of the Architect, any engineers, subconsultants, Subcontractor(s), and Contractor with name of responsible parties; and schedule of products and systems, indexed to content of the volume.

B. For Each Product or System: Contractor shall list names, addresses, and telephone numbers of Subcontractor(s) and suppliers, including local source of supplies and replacement parts.

C. Product Data: Contractor shall mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

D. Drawings: Contractor shall supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Contractor shall not use Project Record Documents as maintenance drawings.

E. Text: The Contractor shall include any and all information as required to supplement product data. Contractor shall provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

F. Warranties and Bonds: Contractor shall bind in one copy of each.

1.05 MANUAL FOR MATERIALS AND FINISHES:

A. Building Products, Applied Materials, and Finishes: Contractor shall include product data, with catalog number, size, composition, and color and texture designations. Contractor shall provide information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Contractor shall include Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture Protection and Weather Exposed Products: Contractor shall include product data listing applicable reference standards, chemical composition, and details of installation. Contractor shall provide recommendations for inspections, maintenance, and repair.

D. Additional Requirements: Contractor shall include all additional requirements as specified in the Specifications.

E. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.06 MANUAL FOR EQUIPMENT AND SYSTEMS:

A. Each Item of Equipment and Each System: Contractor shall include description of unit or system, and component parts and identify function, normal operating characteristics, and limiting conditions. Contractor shall include performance curves, with engineering data and tests, and complete nomenclature, and commercial number of replaceable parts.

B. Panelboard Circuit Directories: Contractor shall provide electrical service characteristics, controls, and communications.

C. Contractor shall include color coded wiring diagrams as installed.

D. Operating Procedures: Contractor shall include start-up, break-in, and routine normal operating instructions and sequences. Contractor shall include regulation, control, stopping, shut-down, and emergency instructions. Contractor shall include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Contractor shall include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Contractor shall provide servicing and lubrication schedule, and list of lubricants required.

G. Contractor shall include manufacturer's printed operation and maintenance instructions.

H. Contractor shall include sequence of operation by controls manufacturer.

I. Contractor shall provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Contractor shall provide control diagrams by controls manufacturer as installed.

K. Contractor shall provide Contractor's coordination drawings, with color coded piping diagrams as installed.

L. Contractor shall provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

M. Contractor shall provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

N. Additional Requirements: Contractor shall include all additional requirements as specified in Specification(s).

O. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.08 SUBMITTAL:

A. Contractor shall submit to the County for review two (2) copies of preliminary draft or proposed formats and outlines of the contents of the Manual within thirty (30) days of Contractor's start of Work.

B. For equipment, or component parts of equipment put into service during construction and to be operated by County, Contractor shall submit draft content for that portion of the Manual within ten (10) days after acceptance of that equipment or component.

C. Contractor shall submit two (2) copies of a complete Manual in final form prior to final Application for Payment. Copy will be returned with Architect/Engineer comments. Contractor must revise the content of the Manual as required by County prior to County's approval of Contractor's final Application for Payment.

D. Contractor must submit two (2) copies of revised Manual in final form within ten (10) days after final inspection.

END OF DOCUMENT

DOCUMENT 01 78 36

WARRANTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Warranty/Guarantee Information;

B. Special Conditions.

1.02 FORMAT

A. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size.

B. Cover: Contractor shall identify each binder with typed or printed title "WARRANTIES" and shall list title of Project.

C. Table of Contents: Contractor shall provide title of Project; name, address, and telephone number of Contractor and equipment supplier, and name of responsible principal. Contractor shall identify each item with the number and title of the specific Specification, document, provision, or section in which the name of the product or work item is specified.

D. Contractor shall separate each warranty with index tab sheets keyed to the Table of Contents listing, providing full information and using separate typed sheets as necessary. Contractor shall list each applicable and/or responsible subcontractor(s), supplier(s), and/or manufacturer(s), with name, address, and telephone number of each responsible principal(s).

1.03 PREPARATION:

A. Contractor shall obtain warranties, executed in duplicate by each applicable and/or responsible subcontractor(s), supplier(s), and manufacturer(s), within ten (10) days after completion of the applicable item or work. Except for items put into use with County's permission, Contractor shall leave date of beginning of time of warranty until the date of completion is determined.

B. Contractor shall verify that documents are in proper form, contain full information, and are notarized, when required.

C. Contractor shall co-execute submittals when required.

D. Contractor shall retain warranties until time specified for submittal.

1.04 TIME OF SUBMITTALS:

A. For equipment or component parts of equipment put into service during construction with County's permission, Contractor shall submit a draft warranty for that equipment or component within ten (10) days after acceptance of that equipment or component.

B. Contractor shall submit for County approval all warranties and related documents within ten (10) days after date of completion. Contractor must revise the warranties as required by the County prior to County's approval of Contractor's final Application for Payment.

C. For items of work delayed beyond date of completion, provide updated submittal within ten days after acceptance, listing the date of acceptance as start of warranty period.

END OF DOCUMENT

DOCUMENT 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Documents on Work;

B. Special Conditions.

PART 2 - RECORD DRAWINGS

2.01 GENERAL:

A. As indicated in the Contract Documents, the County will provide Contractor with one set of reproducible plans of the original Contract Drawings.

B. Contractor shall maintain at each Project Site one set of marked-up prints and each month, or as otherwise agreed, shall transfer all changes and information to those marked-up prints. Contractor shall submit to the Project County one set of reproducible drawings of the Project Record Drawings ("As-Builts") showing all changes incorporated into the Work since the preceding monthly submittal. The Record Drawings shall be available at the Project Site. The Contractor shall submit **three (3) sets of final approved prints and an electronic file** at the conclusion of the Project following review of the prints.

C. Label and date each Record Drawing "RECORD DOCUMENT" in legibly printed letters.

D. All deviations in construction, including but not limited to pipe and conduit locations and deviations caused by without limitation Change Orders, Construction Claim Directives, RFI's, and Addenda, shall be accurately and legibly recorded by Contractor.

E. Locations and changes shall be done by Contractor in a neat and legible manner and, where applicable, indicated by drawing a "cloud" around the changed or additional information.

2.02 RECORD DRAWING INFORMATION:

A. Contractor shall record the following information:

(1) Locations of Work buried under or outside each building, including, without limitation, all utilities, plumbing and electrical lines, and conduits.

(2) Actual numbering of each electrical circuit.

(3) Locations of significant Work concealed inside each building whose general locations are changed from those shown on the Contract Drawings.

(4) Locations of all items, not necessarily concealed, which vary from the Contract Documents.

(5) Installed location of all cathodic protection anodes.

(6) Deviations from the sizes, locations, and other features of installations shown in the Contract Documents.

(7) Locations of underground work, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stub-outs, invert elevations, etc.

(8) Sufficient information to locate Work concealed in each building with reasonable ease and accuracy. In some instances, this may be by dimension, in others, it may be in relation to the spaces in the building near which it was installed.

B. Contractor shall provide additional drawings as necessary for clarification.

C. Contractor shall provide reproducible record drawings, made from final Shop Drawings marked "No Exceptions Taken" or "Approved as Noted."

PART 3 - RECORD SPECIFICATIONS

3.01 GENERAL:

A. Contractor shall mark each section legibly to record manufacturer, trade name, catalog number, and supplier of each Product and item of equipment actually installed.

PART 4 - MAINTENANCE OF RECORD DOCUMENTS

4.01 GENERAL

A. Contractor shall store Record Documents apart from documents used for construction:

(1) Provide files and racks for storage of Record Documents.

(2) Maintain Record Documents in a clean, dry, legible condition and in good order.

B. Do not use Record Documents for construction purposes.

END OF DOCUMENT

DOCUMENT 01 81 00

ASBESTOS ABATEMENT

PART 1 - GENERAL

1.1 SUMMARY

1.1.1 Scope of Work: The "Work" specified herein includes removal and disposal of asbestos-containing construction materials (ACCMs) during the ITD Headquarters Renovation project at 393 13th Street. The Asbestos Abatement Contractor (Contractor) will supply all labor, supervision, materials, equipment, tools, services, insurance and each and every item of expense necessary to perform and complete the Work. Work must be performed as specified herein and in compliance with applicable federal, state and local regulations and industry standards.

Based on previous sampling, ACCMs have been identified in the following building materials:

- Acoustical ceiling plaster in high ceilings of the 1st floor.
- Paint on exterior roof walls on third floor exterior patio.

Note: Although not found in recent sampling there may be isolated areas where residual black mastic/leveling compound may be present underneath carpet/flooring.

Previous asbestos surveys/sampling have been completed in the building and are described below and presented in Appendix A – Previous Survey Reports and Sampling Data:

- Asbestos Investigation Report, 393 13th Street, Oakland, California, September 2001 by Hygienetics, Inc.
- County of Alameda miscellaneous Asbestos Sampling Data.

Use of the reports and sampling data is subject to the limitations set forth in Document 00 31 19 – Existing Conditions Information. It is the responsibility of the Contractor to field verify asbestos locations and quantities before submitting a bid.

The Contractor's work includes any work that will disturb ACCMs during the project and includes, but is not limited to, all classes of asbestos related work (Class I, II, III, IV) that may occur as part of the overall project.

1.1.2 Project IH Consultant: The County's Industrial Hygiene Consultant (hereinafter referred to as the "Project IH Consultant") will provide independent, third-party industrial hygiene consulting services on behalf of the County. Such services may or may not include conducting on-site work observations, materials or environmental testing, and/or consulting with the County. It is not the responsibility of the Project IH Consultant to supervise the Contractor; nor to direct the Contractor's work effort; nor to assume the management of, or responsibility for, the Contractor's health and/or safety practices, nor its waste management, nor its regulatory compliance. At all times, the Contractor shall be solely responsible for the quality and execution of all phases and aspects of the Work.

1.2 SUBMITTALS

1.2.1 General:

1.2.1.1 In addition to any other contractual submittals required of the Contractor, the Contractor will provide to the County the submittals described in this Specification section. Submittals will be reviewed by both the County and the Project IH Consultant for acceptability. The Project IH Consultant will either recommend submittals to the County for acceptance, or will return them to the County as deficient, with notations for correction and re-submission. The Project IH Consultant does not have authority to "approve" submittals.

1.2.1.2 Documents submitted by the Contractor in an effort to comply with the requirements of this Specification section are to be separate and distinct from any other submittals provided to comply with other Specification sections. In attempting to satisfy the requirements of this Specification section, the Contractor must submit only those documents specifically requested to fulfill the specified requirements. Extraneous documentation will be rejected, but not returned.

1.2.2 Schedule and Format:

1.2.2.1 Delivery: Submittals listed in this section must be delivered to the County.

1.2.2.2 Quantity: Six (6) identical, legible copies of each submittal listed in this section shall be delivered in an organized fashion suitable to the County for review. One (1) copy will be conveyed by the County to the Project IH Consultant for review.

1.2.2.3 Work Commencement: No portion of the Work shall be commenced by the Contractor until the submittals are reviewed and accepted by the County.

1.2.2.4 Delays: Delays to the Work resulting from the submittal of deficient or illegible documentation, or from the untimely submittal of potentially acceptable documentation, shall be the sole responsibility of the Contractor. Except as otherwise granted by the County, no extensions will be made to the awarded contract schedule or budget to accommodate such delays.

1.2.2.5 Format: Submittals will be provided in 8-1/2" x 11" format with sections separated by numbered tabs indexed to a printed Table of Contents. Illegible submittals will be considered deficient and returned for correction.

1.2.2.6 Schedule: Submittals delivered to the County will observe and conform with the following timetable:

1.2.2.6.1 Pre-work Submittals – Not less than ten (10) business days prior to the Contractor's mobilization onto the work site, the Contractor shall deliver legible copies of the specified documents. The Project IH Consultant will review submittals and return deficient submittals to the County within five (5) business days following their receipt by the Project IH Consultant. Deficient submittals will be corrected and resubmitted by the Contractor within five (5) business days of their return. Once accepted, the reviewed copy shall be returned to the Contractor, who shall maintain a copy of the accepted submittal at the work site.

1.2.2.6.2 Product Submittals – Not less than ten (10) business days prior to the date of intended use of the product on the work site.

1.2.2.6.3 Post-work Submittals – Except as otherwise specified herein, the Contractor shall, within twenty (20) business days following demobilization from the project site, submit 2 copies of the Post-work Submittals listed in this section. If the Project IH Consultant or the County determines that the Post-work Submittals are unacceptable, the Contractor will be required to correct the deficiencies and re-submit them for review.

1.2.3 Pre-Work Submittals:

1.2.3.1 Progress Schedule: Provide a proposed work schedule indicating the listed items.

1.2.3.1.1 Show the complete sequence of the abatement plan by activity and the sequencing of work within each building, on each floor, and for each regulated work area.

1.2.3.1.2 Show the dates for the beginning and completion of each major element (work area set-ups, gross removal, detail cleaning, preliminary visual inspections, final visual inspections, tear-down, etc.) of the abatement work, including substantial completion dates for each building, on each floor, and for each regulated work area. Update as necessary.

1.2.3.1.3 Provide anticipated manpower distribution per scheduled activity and regulated work area. Distinguish between trained full-time personnel and unskilled or temporary labor. Indicate whether or not any subcontracted labor will be utilized.

1.2.3.1.4 Provide anticipated number of shifts per day and days per week, as well as specific hours for each shift. Indicate any anticipated overtime, weekend work shifts, night shifts or holiday work shifts planned. Unless otherwise directed, plan to conduct all abatement activities during swing shifts (M-F, 5:00 p.m. to 2 a.m. and 9:00 a.m.-5:00 p.m. Saturday and Sunday).

1.2.3.1.5 At a minimum, the Contractor's Progress Schedule is to be formulated on a three-week, "look ahead" basis and updated weekly.

1.2.3.1.6 All requests for deviations from, or changes to, the initially established daily work shift hours and/or the weekly work days shall be submitted in writing to the County and the Project IH Consultant for approval not less than 3 business days prior to the anticipated implementation of said changes. This requirement will also apply to remobilizations following periods of inactivity by the Contractor. The Contractor shall not implement any work schedule changes without the prior expressed approval of the County. The Contractor shall be responsible for its Subcontractors' compliance with these requirements.

1.2.3.2 Notifications/Permits/Licenses:

1.2.3.2.1 Written Notice of Proposed Abatement activity (10-day prior notification) to the applicable air pollution control agency such as the Bay Area Air Quality Management District (BAAQMD) if this project involves the removal of Regulated Asbestos-Containing Materials (RACM) in quantities that exceed notifible thresholds. For floor tile and/or mastic removal operations involving the use of mechanized work methods, including motorized floor buffers, the 10-day prior notification will include appropriate notification of these planned activities, per BAAQMD advisory of June 2003.

1.2.3.2.2 Written Notice of Proposed Abatement activity to the Cal-OSHA Regional Office or any other agency having jurisdiction (24-Hour Temporary Worksite Notification).

1.2.3.2.3 Written proof that all required permits, licenses, and registrations have been applied for and received, or are pending approval. This shall include, but not necessarily be limited to, Contractor State Licensing Board (CSLB) Licenses, California Division of Occupational Safety and Health (DOSH) registrations, and/or as otherwise required by any federal, state, or local governments or regulatory agencies.

1.2.3.3 Worker Documentation:

1.2.3.3.1 Name and social security number of each employee to be engaged in asbestos abatement work.

1.2.3.3.2 Current valid documentation from a Cal/OSHA-approved training provider indicating the most recent asbestos abatement training course and training date that each person listed in Paragraph 1.2.3.3.1. (above) has attended. Legible photocopies of recent (within the preceding 12 months) training certification cards (Laborer's Trust Cards) will suffice, as long as both sides of the card are provided.

1.2.3.3.3 Name and social security number of the Asbestos Project Superintendent. Provide current valid documentation from a Cal/OSHA-approved training provider indicating the most recent asbestos abatement contractor/supervisor training course and training date that he/she has attended. Provide evidence indicating that he/she has a minimum of one year on-the-job experience as an Asbestos Project Superintendent.

1.2.3.3.4 Current valid documentation indicating each worker's most recent respiratory protection training and respirator fit testing. Respirator fit testing documentation must contain all information required in 8 CCR §5144 (m)(2).

1.2.3.3.5 Current valid medical documentation indicating each worker's most recent asbestos medical examination. Each such medical document must be signed by a licensed physician to be acceptable. Illegible or incomplete photocopies, or preliminary examination reports, will be rejected as deficient.

1.2.3.3.6 Current valid medical documentation indicating each worker's medical fitness to wear a tight-fitting respirator and noting any medical

limitations to such respirator usage. Each such medical determination must be signed by a licensed physician to be acceptable. Illegible or incomplete photocopies, or preliminary examination reports, will be rejected as deficient.

1.2.3.3.7 Submit a completed Certificate of Asbestos Worker's Acknowledgment form (Attachment A to this Specification section) for each worker engaged in asbestos-related work. Contractor's employees will not be allowed to engage in asbestos-related work prior to submitting a completed Certificate of Asbestos Worker's Acknowledgment form.

1.2.3.3.8 Submit a completed Certificate of Competent Person Acknowledgment form (Attachment B to this Specification section) for each employee engaged in asbestos-related supervisory work. Abatement Contractor's Competent Person will not be allowed to engage in asbestos-related supervisory work prior to submitting a completed Certificate of Certificate of Competent Person Acknowledgment form.

1.2.3.4 Subcontractors: Submit qualifications and 24-hour contact information for each subcontractor to be used. This shall include two (2) legible copies of federal, state, and/or local business or operating permits, as well as State and/or EPA identification numbers for the waste transporters and disposal facilities to be used.

1.2.3.5 Abatement Work Plan: Submit a detailed work plan indicating the practices and procedures proposed for use in complying with the requirements of this specification. Include in the plan schematic drawings with depictions of the locations and general configurations of all regulated work areas. Mark-ups of current project plans will suffice to satisfy this requirement. For each regulated work area, indicate the planned locations of personal decontamination units, equipment decontamination and waste load-out chambers, exhaust air filtration units, air exhaust locations, temporary utilities locations, work area view ports and any other elements or conditions of significance to the controlled completion of the Work (e.g., location of sanitary or storm drains that will require protection). The text of the Work Plan should address the sequencing of the asbestos work; the interface of any skilled trades involved in the performance of the Work; the methods to be used to assure the safety of site workers and visitors to the site; a disposal plan including the on-site location(s) of secured waste storage areas; and a detailed description of the methods to be employed to prevent environmental impairment of the work site and its surrounding area. Expand upon the use of methods of removal to prohibit visible emissions from within the work areas, and for the packaging and transport of removed asbestos waste or debris. The plan must be reviewed and accepted by the Project IH Consultant prior to the commencement of work.

1.2.3.6 Contingency Plan: Submit a contingency plan for emergencies including, but not necessarily limited to: fire, accidents, medical emergencies, power failures, differential air pressure ("negative air") system failures, or any other event that may require modification of decontamination methods or work area isolation procedures. Include in the plan specific procedures for work area isolation and/or decontamination. **Note**: Nothing in this specification should be interpreted as instructions to impede the rapid and safe exiting from the work area(s), nor to impede the provision of adequate medical attention in the event of an emergency.

Post: In a room immediately adjacent to the Personnel Decontamination Unit(s), prominently display telephone numbers, locations of and driving instructions to, emergency services including, but not necessarily limited to: fire, ambulance, physician, hospital, police, power company, telephone company, and Contractor's job-site Superintendent.

1.2.3.7 Field Logs: Submit a sample of Daily Field Logs, Work Area Entry/Exit Logs, etc. to be used during the asbestos abatement work.

1.2.3.8 Rental Equipment: If rental equipment is to be used in conjunction with this asbestos abatement work, a written notification is to be provided to the rental company informing the company that the rented equipment will be used on an asbestos abatement project. A copy of that written notification will be submitted to the Project IH Consultant. The notification must state how the rented equipment is to be used, how it will be decontaminated following its use, and include a space for the acknowledgement of the rental company that it has been advised of the rented equipment's intended use. The Contractor will obtain written acknowledgment from an authorized representative of the rental company and will return an original signed copy of the acknowledgment to the Project IH Consultant as documentation of compliance with this requirement. In the absence of such rentals, the Contractor will submit a signed declaration on the Contractor's letterhead and signed by an authorized representative of the Contractor stating that no rented equipment will be used by the Contractor on this project.

1.2.3.9 Material Safety Data Sheets: Submit current Material Safety Data Sheets for each potentially hazardous material to be used on the job-site. Refer to above Section 1.2.2.6.2 – Product Submittals.

1.2.3.10 California D.O.S.H. Registration: Submit evidence of the Contractor's registration with the Division of Occupational Safety and Health (Cal-OSHA) to conduct asbestos-related construction work, in accordance with 8 CCR §341.6.

1.2.3.11 Waste Hauling Qualifications: Submit proof of hazardous waste transporter's registration and the vehicle operator training. Submittals shall include, but not necessarily be limited to: business name, address (mailing address and physical location), and business telephone number of the company; primary contact name and emergency contact (24-hour) telephone number; documentation of current State and/or EPA authorization to operate; and insurance coverage.

1.2.3.12 Waste Disposal Facility Qualifications: Submit documentation of the California State and/or EPA-approved waste disposal facility chosen to receive shipments of asbestos-containing waste generated during this Project. Such information will include, but not necessarily be limited to: business name, address (mailing address and physical location), and business telephone number of the facility; primary contact name and emergency contact (24-hour) telephone number; documentation of current State and/or EPA authorization to operate; operator's facility I. D. number; classification and/or types of waste(s) accepted; name, business address and telephone number of insurance provider; documentation of insurance type(s), coverage amounts, and any limitations on liability; and any regulatory agency information pertaining to known citations issued, notices of violations issued,

corrective actions ordered, Records of Decisions rendered, or on-going environmental investigations or known liabilities.

1.2.4 POST-WORK SUBMITTALS:

1.2.4.1 General: In accordance with the requirements of the above Section 1.2.2.6.3 -Post-Work Submittals, submit the following documentation:

1.2.4.1.1 Copies of employee and visitor Work Area Entry/Exit Logs and Daily Field Logs/Reports.

1.2.4.1.2 Waste manifests, weight tickets, and landfill receipts.

1.2.4.1.3 Results of all Contractor's personal exposure air monitoring.

1.2.4.1.4 Manometer print-outs attached to 81/2" x 11" paper. Each page should indicate the dates, times, and work area containment to which the Manometer print-out applies. Print-out pages should be arranged in ascending chronological order.

1.2.4.1.5 Incident reports describing any events such as injuries, accidents, emergencies, or loss of differential air pressure and the actions taken in response.

1.3 QUALITY REQUIREMENTS

1.3.1 Reference Standards:

1.3.1.1 Regulations: Applicable regulations pertaining to this asbestos abatement work include, but are not necessarily limited to, the following:

1.3.1.1.1 Bay Area Air Quality Management District (BAAQMD) - Regulation 11 Hazardous Pollutants Rule 2, dated October 7, 1998 or more recent.

1.3.1.1.2 California Division of Occupational Safety and Health (Cal-OSHA) – Construction Safety Orders - Asbestos, Title 8, California Code of Regulations section 1529, et. seq. (8 CCR §1529).

1.3.1.1.3 California Health and Safety Code Section 25163, et. seq. (Transportation of Hazardous Waste).

1.3.1.1.4 Title 22, California Code of Regulations, Section 66261.24 et. seq. (Characteristics of Hazardous Waste – Toxicity).

1.3.1.1.5 Title 22, California Code of Regulations, Section 66268.7(a)(11).

1.3.1.1.6 Title 22, California Code of Regulations, Section 66268.114 et. seq. (Treatment Standard for Asbestos-Containing Waste).

1.3.1.1.7 California Labor Code sections 6501.5 (Employer Registration); and 6501.9 (Determining the Presence of Asbestos Prior to Contracting for Work).

1.3.1.1.8 California Safe Drinking Water and Toxic Enforcement Act of 1986 (Prop. 65).

1.3.1.1.9 Title 29, Code of Federal Regulations, Parts 1910 and 1926.1101.

1.3.1.1.10 Title 40, Code of Federal Regulations, Part 61, Subpart M, National Emission Standards for Hazardous Air Pollutants (NESHAP). U.S. Environmental Protection Agency (U.S. EPA).

1.3.1.1.11 Title 49, Code of Federal Regulations, Part 172, U.S. Department of Transportation.

1.3.1.1.12 All other applicable Federal, State, and/or Local regulations, codes, and ordinances.

1.3.1.2 Standards: Applicable industry standards pertaining to asbestos abatement work include, but are not limited to, the following:

1.3.1.2.1 American National Standard Institute (ANSI) Publications:

Z9.2 Fundamentals Governing The Design and Operation of Local Exhaust Systems; and

Z88.2 Practices for Respiratory Protection.

1.3.1.2.2 U. S. Environmental Protection Agency (EPA): Publication No. 560/5-85-024 Guidance for Controlling Asbestos-Containing Materials in Buildings, June, 1985

1.3.1.2.3 American Society for Testing Materials (ASTM) Publications:

E1368-05e1 Standard Practice for Visual Inspection of Asbestos Abatement Projects; and

E1542-93 (2004) Standard Terminology Relating to Occupational Health and Safety.

1.3.1.2.4 National Institute of Occupational Safety and Health (NIOSH) Publications:

Manual of Analytical Methods:

Method 7400 Asbestos and Other Fibers by PCM; and

Method 7402 Asbestos Fibers by TEM.

1.3.1.2.5 Underwriters Laboratories, Inc. (UL) Publication:

UL 586 High Efficiency, Particulate, Air Filter Units

1.3.1.3 Applicability. The most current version of each document will apply. Where conflicts among these regulations or standards exist, the more stringent requirement or interpretation will apply.

1.3.2 Definitions: In addition to definitions provided elsewhere in these specifications, the following definitions shall apply:

1.3.2.1 **Abatement:** The procedure to control fiber release from asbestos-containing building materials. Activities include removal, encapsulation, and enclosure.

1.3.2.2 **Adequately Wet:** A term defined in 40 CFR 61, Subpart M and EPA 340/1-90-019 that means to sufficiently mix or penetrate with liquid to prevent the release of particulates. If visible emissions are observed to be coming from ACM or ACCM, then that material has not been adequately wetted. The absence of visible emissions, however, is not sufficient evidence of being adequately wetted.

1.3.2.3 **Aggressive Clearance:** Final clearance air monitoring of a regulated asbestos work area which utilizes leaf blowers, fans, and similar tools to "aggressively" disturb and entrain any settled residual asbestos fibers for the purpose of capturing them during sampling.

1.3.2.4 **Air Lock:** A system for permitting ingress and egress with minimum air movement between a contaminated area and an uncontaminated area.

1.3.2.5 **Air Monitoring:** The process of measuring the fiber content of a specific volume of air in a stated period of time.

1.3.2.6 **Amended Water:** Water to which a surfactant has been added.

1.3.2.7 **Asbestos:** The general name given to a group of fibrous mineral forms including chrysotile, crocidolite, amosite, tremolite anthophyllite, and actinolite and any of these minerals that have been chemically treated or altered.

1.3.2.8 **Asbestos-Containing Hazardous Waste:** Any material that contains more than one percent asbestos and is in a friable, finely divided, or powered state. Alternatively, any mixture of material(s) which contains (i.e. is contaminated with) equal to, or greater than, one percent friable asbestos is also asbestos-containing hazardous waste.

1.3.2.9 **Asbestos-Containing Material:** any material containing more than one percent (1%) asbestos.

1.3.2.10 **Asbestos-Containing Construction Material:** any manufactured construction material which contains more than one tenth of 1 percent (0.1%) asbestos by weight.

1.3.2.11 **Asbestos Abatement Contractor:** The contractor or subcontractor designated in the contract documents as being responsible to the County for the control or abatement of asbestos-containing or asbestos-contaminated materials.

1.3.2.12 **Asbestos Permissible Exposure Limit (PEL):** The Contractor will assure that no employee is exposed to an airborne concentration of asbestos of greater than 0.1 fibers per cubic centimeter (f/cc) as based on an 8-hour time-weighted average (TWA).

1.3.2.13 **Authorized Visitor:** The County or designated representative, the Project IH Consultant, the Project IH Consultant's inspector or representative, or any

representative of a federal, state, county, city, or local agency having legal or regulatory jurisdiction over the project while acting in an official capacity. Any person whose name appears upon an approved authorized visitor's list.

1.3.2.14 **Background Monitoring:** See "Prevalent Level Monitoring."

1.3.2.15 **Class I Asbestos Work:** Activities involving the removal of thermal system insulation (TSI) and surfacing ACM and PACM. For the purposes of this specification, asbestos-containing resilient sheet flooring ("linoleum") will also be removed as "Class I Asbestos Work."

1.3.2.16 **Class II Asbestos Work:** Activities involving the removal of ACM which is not TSI or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard or joint compound, floor tile, roofing materials, sidings and construction mastics.

1.3.2.17 **Clean Room:** An uncontaminated area or room which is part of the worker decontamination enclosure with provisions for storage of worker's street clothes and protective equipment.

1.3.2.18 **Competent Person:** In addition to the definition in 29 CFR §1926.32 (f), one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR §1926.32 (f): in addition, for Class I and Class II work, one who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR §763) for supervisor, or its equivalent and, for Class II and Class IV work, one who is trained in a manner consistent with EPA requirements for training of local education agency maintenance and custodial staff as set forth at 40 CFR §763.92 (a)(2).

1.3.2.19 **County:** The County of Alameda and its designated representative(s).

1.3.2.20 **Critical Barrier:** One or more layers of plastic sealed over an opening into a work area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in a work area from migrating to an adjacent area.

1.3.2.21 **Curtained Doorway:** A device to allow ingress and egress from one room to another while permitting minimal air movement between the rooms, typically constructed by placing two overlapping sheets of plastic over an existing or temporarily framed doorway, securing the vertical edge of one sheet along one vertical side of the doorway, and securing the vertical edge of the other sheet along the opposite vertical side of the doorway.

1.3.2.22 **Decontamination Enclosure System:** A series of connected rooms, with curtained doorways between any two adjacent rooms, for the decontamination of workers and of materials and equipment. A decontamination enclosure system always contains at least one airlock.

1.3.2.23 **Differential Air Pressure Equipment:** A portable local exhaust fan or "unit" equipped with HEPA filtration and capable of maintaining a constant, negative air pressure differential within the regulated work area by providing a low velocity air

flow into contaminated areas from adjacent uncontaminated areas and exhausting filtered air outside the work area (preferably to the outdoor air).

1.3.2.24 **Disturbance:** Activities that disrupt the matrix of ACM/ACCM or PACM, crumble or pulverize ACM/ACCM or PACM, or generate visible debris from ACM/ACCM or PACM. This term includes activities that disrupt the matrix of ACM/ACCM or PACM, render ACM/ACCM or PACM friable, or generate visible debris. Disturbance includes cutting away small amounts of ACM/ACCM and PACM, no greater than the amount which can be contained in one standard sized glove bag or waste bag in order to access a building component. In no event shall the amount of ACM/ACCM or PACM so disturbed exceed that which can be contained in one glove bag or waste bag which shall not exceed 60 inches in length and width.

1.3.2.25 **DOP Testing:** The challenge testing of HEPA-filtered equipment, using appropriate aerosols. A 0.3 μm dioctylphthalate aerosol was formerly used in challenging the efficiency of HEPA-filtered equipment. Although dioctylphthalate compounds are now suspected human carcinogens, the phrase "DOP testing" is still current vernacular for the process of challenge testing the efficiency of HEPA-filtered equipment.

1.3.2.26 **Encapsulant:** A liquid material which can be applied to asbestos-containing materials and which prevents the possible release of asbestos fibers from the material either by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components together (penetrating encapsulant). A sealant.

1.3.2.27 **Encapsulation:** All herein specified procedures necessary to apply an encapsulant to asbestos-containing building materials to control the possible release of asbestos fibers into the air.

1.3.2.28 **Enclosure:** All herein specified procedures necessary to completely enclose asbestos-containing material behind airtight, impermeable, permanent barriers.

1.3.2.29 **Equipment Decontamination Enclosure:** That portion of a decontamination enclosure system designed for controlled transfer of materials and equipment, typically consisting of a washroom and a holding area.

1.3.2.30 **Equipment Room:** A contaminated area or room which is part of the worker decontamination enclosure with provisions for storage of contaminated clothing and equipment.

1.3.2.31 **Excursion Limit:** The Contractor will assure that no employee is exposed to an airborne concentration of asbestos of greater than 1.0 fiber per cubic centimeters (f/cc) as an average over a sampling period of thirty minutes.

1.3.2.32 **Fixed Object:** A unit of equipment or furniture in the work area which cannot be removed from the work area.

1.3.2.33 **Friable:** Material(s) that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. Material that has been rendered to a finely divided or powered state will also be considered to be "friable."

1.3.2.34 **Glovebag:** Not more than a 60 x 60 inch impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which material and tools may be handled.

1.3.2.35 **Glovebag Technique**: A method with limited applications for removing small amounts of friable asbestos-containing material from HVAC ducts, short pipe runs, valves, joints, elbows, and other non-planer surfaces in an otherwise non-enclosed work area. The glovebag assembly is a manufactured or pre-fabricated device consisting of a glovebag (typically constructed of 6-mil transparent regulate plastic), two inward projecting long sleeve rubber gloves, one inward projecting sleeve, an internal tool pouch, and an attached, labeled receptacle for asbestos waste. The glovebag is constructed and should be installed in such a manner that it will surround the ACCM or ACM to be removed and will contain all asbestos fibers released during the removal process. All workers who are permitted to use the glovebag technique must be trained, experienced, and skilled in this method. Limitations on, and requirements pertaining to glovebag work, as set forth in 8 CCR §1529 et. seq., will be observed and complied with during this Work. The number of contiguous glove-bags that may be used within a regulated work area will be at the discretion of the Project IH Consultant.

1.3.2.36 **Holding Area:** A chamber in the equipment decontamination enclosure located between the washroom and an uncontaminated area. The holding area comprises an airlock.

1.3.2.37 **HEPA Filter:** A High-Efficiency Particulate Air (HEPA) filter capable of trapping and retaining 99.97 percent of particles (asbestos fibers) greater than 0.3 micrometers in mass median aerodynamic equivalent diameter.

1.3.2.38 **HEPA Vacuum Equipment:** Vacuuming equipment manufactured with a HEPA filter system.

1.3.2.39 **Leak Tight:** Solids, liquids or dusts cannot escape or spill out.

1.3.2.40 **Log Book:** A notebook or other book containing essential project data and daily project information and a daily project diary. This book shall be kept up to date and on the project site at all times.

1.3.2.41 **Movable Object:** A unit of equipment or furniture in the work area which can be removed from the work area.

1.3.2.42 **MSDS:** Material Safety Data Sheet.

1.3.2.43 **Negative Initial Exposure Assessment:** A demonstration by the employer, which complies with the criteria in paragraph (f)(2)(C) of 8 CCR §1529, that employee exposure during an operation is expected to be consistently below the PEL and Excursion Limit.

1.3.2.44 **NIOSH:** National Institute of Occupational Safety and Health.

1.3.2.45 **Phase Contrast Microscopy (PCM):** NIOSH Method 7400 using "A" counting rules.

1.3.2.46 **Plasticize:** To cover floors and walls with plastic sheeting as herein specified.

1.3.2.47 **Presumed Asbestos Containing Material (PACM):** Thermal system insulation and surfacing material found in buildings constructed no later than 1980. The designation of a material as "PACM" may be rebutted pursuant to 8 CCR §1529 (k)(5).

1.3.2.48 **Prevalent Level Monitoring:** Air sampling conducted for the purposes of evaluating existing ambient airborne fiber concentrations prior to starting abatement activities.

1.3.2.49 **Regulated Area:** An area established by the employer to demarcate areas where Class I, II and/or III asbestos work is conducted, and/or any adjoining area where debris and waste from such asbestos work may accumulate; a work area within which airborne concentrations of asbestos exceed, or where there is a reasonable expectation they may exceed, the permissible exposure limit. Requirements for regulated areas are set out in paragraph (e) of 8 CCR §1529.

1.3.2.50 **Removal:** All herein specified procedures necessary to remove asbestos-containing materials from the designated areas in an appropriate manner and to dispose of these materials at an acceptable site.

1.3.2.51 **Shower Room:** A room between the clean room and the equipment room in the worker decontamination enclosure with hot and cold or warm running water and suitably arranged for complete showering during decontamination.

1.3.2.52 **Small-Scale, Short Duration Work:** For the purposes of this Specification, asbestos abatement work that meets the Cal-OSHA definition of Class III asbestos work and that can be completed in no more than 4 hours by no more than 2 workers.

1.3.2.53 **Surfacing Material:** Material that is sprayed, troweled-on or otherwise applied to surfaces (such as acoustical plaster on ceilings or walls and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, and other purposes).

1.3.2.54 **Surfactant:** A chemical wetting agent added to water to improve penetration.

1.3.2.55 **Thermal System Insulation (TSI):** ACM or ACCM applied to pipes, fittings, boilers, breaching, tanks, ducts or other structural components to prevent heat loss or gain.

1.3.2.56 **Time Weighted Average (TWA):** The TWA is an 8-hour time weighted average of the airborne concentration of fibers (longer than 5 micrometers) per cubic centimeter of air (f/cc) which represents the employee's 8-hour workday exposure as determined by the formula:

$$\text{8-hour TWA} = \frac{(C_1T_1+C_2T_2+C_nT_n)}{480 \text{ minutes}}$$

where "C" is the contaminant concentration measured in units of f/cc and "T" the measurement time period in units of minutes.

1.3.2.57 **Transmission Electron Microscopy (TEM):** A method of analyzing air samples for asbestos fibers using a transmission electron microscope and associated instrumentation.

1.3.2.58 **Visible Emissions:** Any emissions containing particulate asbestos material that are visually detectable without the aid of instruments. This does not include condensed uncombined water vapor.

1.3.2.59 **Washroom:** A room between the work area and the holding area in the equipment decontamination enclosure system. The washroom comprises an airlock.

1.3.2.60 **Wet Cleaning:** The process of eliminating asbestos contamination from building surfaces and objects by using cloths, mops, or other cleaning tools which have been dampened with amended water, and disposing of these cleaning tools as asbestos-contaminated waste.

1.3.2.61 **Work Area:** Designated rooms, spaces, or areas of the project in which asbestos abatement actions are to be undertaken or which may become contaminated as a result of such abatement actions. A contained work area is a work area which has been sealed, plasticized, and equipped with a decontamination enclosure system. A non-contained work area is an isolated or controlled-access work area which has not been plasticized nor equipped with a decontamination enclosure system.

1.3.2.62 **Worker Decontamination Enclosure System:** That portion of a decontamination enclosure system designed for controlled passage of workers, and other personnel and authorized visitors, typically consisting of a clean room, a shower room, and an equipment room separated by air locks.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Product Prohibitions: The following products or product constituents are prohibited from use during asbestos abatement activities:

2.1.1.1 Any product for which a Material Safety Data Sheet is available from the manufacturer and has yet to be submitted.

2.1.1.2 Any product for which a less hazardous substitute product is readily available, provided that the substitute product possesses similar performance characteristics.

2.1.1.3 Any product containing any concentration of diethylene glycol dimethyl ether; ethylene glycol monoethyl ether; or ethylene glycol mono methyl ether (skin TLV 5 ppm; CAS 109-86-4). These constituents cause reproductive damage and blood cell damage.

2.1.1.4 Any product containing any concentration of ethylene glycol (1,2 Ethanediol glycol; TLV = 50 ppm). This chemical causes kidney damage if ingested.

2.1.1.5 Any product containing any concentration of formaldehyde, a suspect carcinogen.

2.1.1.6 Any product containing any concentration of methylene chloride, a suspect carcinogen.

2.1.1.7 Any product containing any concentration of n-hexane. This chemical causes peripheral nerve damage (potential ingredient in spray adhesive).

2.1.1.8 Any product containing any concentration of isocyanates. An allergic sensitizer, this group of chemicals typically has no warning properties (potential ingredient in spray foams and some epoxies).

2.1.1.9 Non-fire rated visquene and/or non-fire rated lumber are prohibited from use.

2.1.1.10 Solvents with a flash point $<140^{o}$ F are prohibited from use.

2.1.2 Equipment Prohibitions: The following equipment is prohibited from use during asbestos abatement activities:

2.1.2.1 Fasteners: High velocity powder-actuated fasteners are prohibited from use without the expressed written permission of the County.

2.1.2.2 Torches: Open flame torches are prohibited from use for asbestos abatement purposes.

2.1.2.3 Compressed Air: Air compressors, leaf blowers or similar forced-air equipment is prohibited from use for asbestos abatement purposes.

2.1.2.4 Lamps: Sodium or mercury vapor (metal halide) lamps are prohibited from use.

2.1.2.5 Ladders: Wooden or metal ladders are prohibited from use.

2.1.2.6 Engines: Internal combustion engines shall not be permitted for operation indoors without the expressed written permission of the County in consultation with the Project IH Consultant.

2.1.2.7 Grounded Electrical Equipment: Electrical equipment manufactured with internal grounding or grounded wiring shall not be used if the grounding has been removed, tampered with, or otherwise altered.

2.1.2.8 HEPA-Filtered Vacuum Cleaners Without Certification of Efficiency Challenge Testing: Vacuums without certification of on-site testing for efficiency ("DOP testing") shall not be allowed for use outside of a negative differential pressure enclosure ("containment").

2.1.3 Material Requirements:

2.1.3.1 Sealants: Sealants used will have a flame spread, smoke and fuel contribution of zero, and will be ASTM and UL rated for 3 hours for standard method fire test for fire stop systems.

2.1.3.2 Lock-down Encapsulants: Lock-down encapsulants used will be compatible with substrate to which they will be applied, as well as with adhesives or other finish materials which may be applied over such encapsulants.

2.1.3.3 Visquene Sheeting: Visquene sheeting used will be in compliance with NFPA Standard 701 fire testing, with flame spread ≤ 5 and smoke development rating of ≤ 70 when tested by ASTM E-84. Minimal thickness will be 6 mil.

2.1.3.4 Spray Poly: Spray poly as a liquid must be non-flammable (no flash point), vapor free, and not noxious; when dry, poly must be Class A rated, with flame spread ≤20, have a fuel contribution of zero, and smoke development of ≤ 110 by ASTM method E-84.

2.1.3.5 Waste Containers: Waste containers (bags, drums, bins, etc.) must be suitable for loading, temporary storage, transit, and unloading of asbestos waste without rupture, or otherwise causing asbestos exposure to persons nor releases to the atmosphere. Use of rigid primary containers (bins, boxes, drums, etc.) is preferred and recommended. Where rigid primary containers are used, they shall be lined with a secondary leak tight barrier of poly sheeting or poly bags of minimal thickness of 6 mil. All containers used for disposal of asbestos-containing waste shall be labeled in general accordance with applicable regulations, and in specific with the requirements of 8 CCR §1529(k)(8) and BAAQMD Regulation 11, Rule 2. See section 3.2.3.2 of this Specification section for additional details.

2.1.3.6 Adhesives: Adhesives, whether tape or aerosol liquid, shall be capable of securely bonding plastic to plastic, or plastic to substrate. The bonding strength and resulting seal of the material used must not be compromised by mist or water, encapsulating agent or any other product or process used in the regulated work area.

2.1.3.7 Warning Signs and Labels: Warning signs and labels will be used in compliance with applicable federal, state, and local regulations. Signs must be lettered in the language(s) necessary to communicate the specific hazard warning(s) to workers or visitors reasonably expected to be at the job site.

2.1.4 Equipment Requirements:

2.1.4.1 General: It is the responsibility of the Contractor to utilize tools and equipment that have been thoroughly and adequately decontaminated prior to their delivery to this project site. All equipment brought onto this project work site will be subject to inspection by the County and/or the Project IH Consultant. Visible evidence of suspected equipment contamination will be sufficient to cause the equipment to be rejected from mobilization onto the project work site. All costs resulting from the need to decontaminate any part of the worksite contaminated by the Contractor's use of inadequately decontaminated equipment will be borne by the Contractor.

2.1.4.2 Differential Air Pressure Equipment: Differential air pressure equipment (also known as "exhaust fan units" or "negative air machines") shall be equipped with HEPA filtration. All differential air pressure equipment will be in well-maintained condition and will comply with ANSI/AIHA Standard Z9.2 for performance. Differential air pressure equipment will arrive on-site with the intake and exhaust openings sealed. Each unit must be efficiency-challenged ("DOP tested") on-site, in the presence of the Project IH Consultant and prior to use, so as to ensure a minimum 99.97% filtering efficiency of aerosol particulates of 0.3 microns in size. DOP testing shall be performed by a professional third-party testing firm not otherwise financially affiliated with the Contractor. Each unit used on this project must have a certification label affixed to it attesting to its most recent successful testing. Upon

arriving on-site, each unit must be visibly clean and free of apparent or suspected asbestos contamination, as judged by the Project IH Consultant. If, in the opinion of the Project IH Consultant, the differential air pressure units are judged to be in need of cleaning, maintenance, or in any other way fail to meet typical industry standards, the unit(s) may not be placed into operation on this project. If secured, negative air machines may be stacked, but no more than two high without the prior approval of the Project IH Consultant, and in no event will negative air machines be allowed to be inverted for the purpose of stacking.

2.1.4.3 HEPA-filtered Vacuum Cleaners: HEPA-filtered vacuum cleaners will be in well-maintained condition, and must be visibly clean and free of apparent or suspected contamination, as judged by the Project IH Consultant. **Each unit must arrive on-site sealed and empty of any debris.** Each unit must be DOP tested on-site, within containment or outside of the building, before it can be used outside of a regulated work area. DOP testing will be performed by a professional third-party firm not otherwise financially affiliated with the Contractor. Each unit used on this project must have a certification label affixed to it attesting to its most recent successful testing. If, in the opinion of the Project IH Consultant, the HEPA-filtered vacuum cleaners are judged to be in need of cleaning, maintenance, or in any other way fail to meet typical industry standards, the vacuum cleaners may not be placed into operation on this project. Care will be exercised by the Contractor to prevent commingling of asbestos and lead waste. Separate vacuums will be used for each type of waste clean-up.

2.1.4.4 Lights and Electrical Cords: Electrical lights and equipment utilizing electrical power cords will be in well-maintained condition and will be visibly clean and free of apparent contamination, as judged by the Project IH Consultant. All lighting and electrical equipment must be water resistant. Work lighting must have protective covers over the light source. Grounded electrical equipment will be used with grounded electrical supply and outlets. Where such equipment will be used in the near vicinity of water, ground fault circuit interruption (GFCI) protection shall be used in the wiring circuit at the first feasible point closest to the source of power.

2.1.4.5 Personnel Decontamination Facilities: At a minimum, a 3-chamber personnel decontamination (decon) unit with functioning shower will be constructed and used whenever Class I work is being conducted. A decon unit with shower will be constructed contiguous with each Class I regulated work area. Use of a remote shower for Class I work may be allowed where a contiguous shower is infeasible, as judged by the Project IH Consultant. A curtained doorway (see Section 1.3 C above) will be constructed to separate individual chambers within a personnel decon unit, as well as at ingress and egress points. The decon units shall be constructed in a manner so as to be free of physical hazards (e.g., jagged metal or exposed wood surfaces). **To the extent feasible, a personnel decon unit must not be used for waste load-out.**

2.1.4.6 Water Filtration Equipment: Water will be collected from decontamination unit showers and from general asbestos abatement activities and must be filtered prior to discharge. Water will be filtered through a system capable of trapping particles 1 micron and larger in size, intended to remove asbestos fibers. Filtered water may be discharged into a sanitary sewer system, if the Contractor can satisfactorily demonstrate that it is acceptable to the local wastewater treatment facility to do so. The Contractor will bear the responsibility to investigate discharge requirements and to obtain any necessary discharge permits prior to the start of work. To the extent

feasible, water should be reclaimed and used on-site for application in wet method work practices prior to its discharge.

2.1.4.7 Fire Extinguishers: Fire extinguishers, rated not less than 2A or as specified by more stringent regulations, will be required in the regulated work area(s). The minimum allowable number of fire extinguishers in any individual work area will be one in the regulated work area and one in the clean area.

2.1.4.8 Smoke Detectors: The Contractor will exercise due caution to not engage in activities that will inhibit the proper functioning of operable smoke detectors during the Work. The Contractor will take steps to preserve and protect any operable smoke detectors from damage during the Work. The Contractor must coordinate in advance with the local fire authority and the County prior to proceeding with any work activities that may require the disabling of an installed fire suppression system or a smoke detector. The Contractor will designate a person or persons to the responsibility of "Fire Watch" for the duration of time that an installed fire suppression system or a smoke detector(s) is required to be disabled.

2.1.4.9 Manometers: Use of data-logging manometers to record differential air pressure measurements within all regulated work areas is required on this project, irrespective of the Cal/OSHA Class of asbestos work being undertaken. A separate manometer shall be used to document diminished air pressure differential within each regulated work area. Exceptions will not be allowed due to concerns for equipment security. It is the Contractor's responsibility to provide and secure all equipment for the duration of this project. Manometers used to monitor air pressure within a regulated work area shall have been calibrated to the manufacturer's specifications within the previous 12 months. Manometers shall have real-time digital read-out; an audible alarm; a hardcopy record (tape or circular disk) and be capable of continuous data logging and printing out a data record. The data collected will begin at the time of the initial establishment of a diminished air pressure differential within a regulated work area and continue until acceptable analytical results of final air clearance testing results for that work area are received and conveyed to the Contractor.

PART 3 - EXECUTION

3.1 PREPARATION

3.1.1 Examination of Conditions: The Contractor must carefully examine the work site before beginning work and report any previously undisclosed or special conditions to the County. Except as may be otherwise stipulated elsewhere in the Contract Documents, starting the Work shall be interpreted as implied acceptance of site conditions as they exist.

3.1.2 Responsibility for Work: By commencing the Work, the Contractor acknowledges and agrees that he has sole and primary responsibility and obligation to the County to make inspections of his own work at all stages of the Work. This includes acknowledging and agreeing that he has sole responsibility to supervise or superintend the performance of the Work, and that said work will be in strict adherence to, and in compliance with, all applicable methods, materials, regulations, and required standards whether or not specified herein. The Contractor is responsible for site security upon starting the project. This responsibility extends 24 hours per day until project completion and final demobilization.

3.1.3 Coordination Of Work: The Contractor is responsible to coordinate all scheduling, phasing, and completion of asbestos abatement work with the County and all other employers working on the

job site during the abatement activities. This includes the responsibility to make notifications or communications of hazards to other trades or employers, as required by regulation.

3.1.4 Measurements and Quantities: The Contractor is responsible to field verify all measurements, dimensions and/or quantities before the start of work. Discrepancies between plan and field dimensions or quantities shall be reported to the County as soon as discovered.

3.1.5 Job Site Postings: Prior to commencing any preparation of the work area(s) for asbestos removal operations, the Contractor will post all required documents, warning signs, and erect any physical barriers in order that the work area(s) may be secured. Prior to the commencement of any work, the Contractor will post bilingual or multi-lingual (as appropriate) warning signage in and around the work site in compliance with applicable regulations.

3.1.6 Pre-Work Conference: Prior to the start of any work, the Contractor will meet at the project site with the Project IH Consultant, the County, and other entities involved in, or associated with, the asbestos abatement work. This will be an organizational meeting to review responsibilities and personnel assignments; to identify any special needs or conditions pertaining to the Work or its completion; to identify the work area containment(s) and decontamination areas; and to coordinate temporary facilities including power, light, water, waste storage, etc.

3.1.7 Work Area Preparation:

3.1.7.1 Work Area Designation: Each regulated work area will be designated by the Contractor and discussed with the Project IH Consultant prior to its preparation. At a minimum, discussion topics will include ingress and egress points, work area configurations, containment methods, location of viewing ports, and installation of decontamination system enclosures. This communication may be accomplished at the Pre-Work Conference.

3.1.7.2 Electrical Lock-out: The Contractor, in coordination with the County, is responsible for the shutdown and disconnection of all electrical power within the work area. For the purposes of this Specification section, the work area is defined as including all wall, floor and/or ceiling cavities which will be opened as a result of the removal of wall, floor or ceiling materials. The Contractor will arrange for temporary power and lighting, and will ensure safe installation of temporary power sources and equipment per applicable electrical code requirements. The Contractor should notify the County in writing before disconnecting any power or communication lines that may service the subject buildings or adjacent buildings.

3.1.7.3 HVAC Isolation: The Contractor is required to shut down and isolate mechanical (heating, cooling, and ventilating) air systems to prevent contamination or fiber dispersal to other areas of the building. During the Work, HVAC vents and any other airway openings into and out of the Work Area will be sealed with barriers consisting of a minimum 2 layers of 6-mil poly sheeting and duct tape ("critical barriers"). In the event of any containment breaches, filters in the HVAC system(s) will be removed and disposed of as asbestos-contaminated waste.

3.1.7.4 Work Area Containment: Each regulated work area will be regulated and isolated ("contained") from all building areas not a part of the Work. All critical openings including, but not limited to, doorways, windows, tunnels, ducts, grills, diffusers, or openings through which ducting, piping or conduit passes are to be sealed securely

with duct tape, spray adhesives, plastic sheeting or by other means, as necessary, to prohibit the passage of air out of the regulated work area. Any fixed objects to remain within the proposed work area will be cleaned using HEPA vacuum equipment and/or wet cleaning methods as appropriate, and completely enclosed with plastic sheeting. The plastic sheeting shall be, at a minimum, 6-mil fire-rated poly. Once fully constructed, the Contractor will inspect the containment for gaps, breaches, tears, leaks, holes or other deficiencies. The Contractor will conduct a similar inspection not less than once at the start of each work shift, however, the Contractor will be responsible to ensure the integrity of the containment(s) at all times. Containment deficiencies shall be corrected immediately and with utmost priority upon discovery.

3.1.7.5 Decontamination Facilities: At a minimum, a 3-chamber personnel decontamination (decon) unit with functioning shower will be constructed and used whenever Class I work is being conducted. Cover the floor under the decontamination units, hoses, and equipment with at least one layer of 6-mil poly. Securely affix the poly sheeting to the floor. A personnel decon unit with shower will be constructed contiguous with each Class I regulated work area. Use of a remote shower for Class I work may be allowed where a contiguous shower is infeasible, as judged by the Project IH Consultant. A curtained doorway (see Section 1.3.2 above) will be constructed to separate individual chambers within a personal decon unit, as well as at ingress and egress points. The decon units shall be constructed in a manner so as to be free of physical hazards (e.g., jagged metal or exposed wood surfaces). Other alternate decontamination facilities may be used for compliance with Class II asbestos work or asbestos roofing removal work. **To the extent feasible, a personnel decon unit must not be used for waste load-out.**

3.1.7.6 Movable and Loose Items: Movable and loose items located within the work area(s) and not removed by the County are to be cleaned using HEPA-filtered vacuum equipment and/or wet cleaning methods, as appropriate, and will be removed from the work area to a temporary location designated by the County. The items will be received by and protected from future damage or loss by the County.

3.1.7.7 Pre-Cleaning: The Contractor will clean each work area prior to commencing the construction of a regulated work area containment. Such "pre-cleaning" will be by means of HEPA-filtered vacuum equipment and/or wet cleaning methods, as appropriate. The Contractor will use cleaning methods that minimize dust generation. Prohibited methods include shoveling, dry sweeping, use of forced or compressed air, or vacuuming with equipment not equipped with HEPA filtration. Workers engaged in "precleaning" activities are required to use appropriate personal protective equipment, including respiratory protection.

3.1.7.8 OSHA Class I Work Area Isolation: For Work Areas within which OSHA Class I asbestos work is to be conducted (removal of thermal system insulation [TSI] or surfacing material), the Contractor will erect a full, diminished air pressure enclosure. In addition to sealing critical openings, a minimum of one layer (additional layers may be required based on the localized conditions) of fire-rated 6-mil plastic sheeting will be installed on the walls, floors, and ceilings (as appropriate for the location and/or type of material[s] being removed). Exceptions to this may apply to the removal of TSI by means of glovebag techniques. In the case of TSI removal using glovebags, full-room ("secondary containment") or partial-

room ("mini-enclosure") containment structures may, at the Project IH Consultant's discretion, be additionally required. Floor layers shall be applied making sure that plastic is turned-up at the wall at least 16 inches and sealed to wall layers. Wall layers shall be sealed by overlapping the turned-up floor plastic a minimum of 12 inches. All joints and seams for each layer shall be glued and taped securely in a manner so as to prohibit water or air movement through the attached sheetings.

3.1.7.9 "Wrap and Cut" Removal of TSI: For Work Areas within which OSHA Class I asbestos work consisting primarily of TSI (piping insulation) removal is to be conducted by means of "Wrap and Cut" method, the Contractor will prepare the Work Area in full compliance with the requirements of BAAQMD Regulation 11, Rule 2, and the requirements of Cal-OSHA 8 CCR §1529 (g) for conducting Class I asbestos work. Removal of asbestos-containing TSI for the purposes of accessing the piping to facilitate cutting the pipe will be done by first removing a portion of the TSI by glovebag method and sealing the remaining cut ends of asbestos-containing materials. Once the uninsulated pipe is exposed, the remaining insulated section to be removed will be wrapped in a minimum of two layers of 6-mil poly before being removed from the work area. For the purposes of this Work, "Wrap and Cut" removal of TSI will meet the regulatory definitions of "removal" and "removing" set forth in Cal-OSHA 8 CCR §1529 et. seq. and BAAQMD Regulation 11, Rule 2, respectively. The Contractor will seek and obtain the approval of the County prior to implementing "Wrap and Cut" activities.

3.1.7.10 OSHA Class II Work Area Isolation: For Work Areas within which OSHA Class II asbestos work is to be conducted, the Contractor will prepare the Work Area in accordance with the regulatory requirements of Cal-OSHA 8 CCR §1529 et. seq. and BAAQMD Regulation 11, Rule 2. In addition, a diminished air pressure enclosure, as documented by manometric measurements (see Section 2.1 D. 9. above) is required for all OSHA Class II Work. OSHA Class I Work Area isolation controls may be used for Class II work.

3.1.7.11 Localized Limited Work Area Isolation: For Work Areas where small-scale, short duration ACCM or ACM removal work will occur, the Contractor may, with the approval of the Project IH Consultant, use Localized Limited Work Area Isolation ("mini-containment") methods. For the purposes of this Specification, the phrase "small-scale, short duration ACCM or ACM removal work" shall generally apply to that ACCM or ACM removal work which can be completed by no more than two (2) workers in no more than four (4) hours; and which generates no more ACCM or ACM waste than can be contained in one (1) standard-sized (60") waste bag. At a minimum, such a Work Area shall be fully enclosed with one layer of 6-mil plastic; critical barriers shall be sealed; the mini-containment shall have a diminished interior pressure differential, and a curtained doorway for ingress/egress use. Additional enclosure measures may be required at the discretion of the Project IH Consultant. Localized Limited Work Area containments must be constructed so as to comply with all regulatory requirements including, but not necessarily limited to, BAAQMD and Cal-OSHA.

3.1.7.12 Substrate Removal: In certain locations, asbestos-containing materials to be removed may have been identified as being present on wooden or other substrates that will also be subject to building demolition (e.g., adhesive on wallboard). At the Contractor's discretion, and with the concurrence of the County, such materials may

be removed by means of removing the substrate material to which the ACM or ACCM is adhered. As a priority, consideration must be given to the use of methods that will minimize the weight or volume of waste generated by the use of this removal method. This method of removal should not be employed in locations where doing so will result in the creation of an imminent safety hazard.

3.1.7.13 Work Area Obscurity: The Contractor will endeavor to block or obscure the view of the public into the asbestos abatement work areas, but retain appropriate view portals in compliance with BAAQMD.

3.1.7.14 Adjacent Areas: Building areas immediately adjacent to regulated asbestos removal areas, such as corridors or hallways which are not themselves subject to asbestos material removal, but are necessary routes to and from regulated work areas, must be protected by the Contractor to prevent damage and/or contamination. Openings from these areas into areas where asbestos material removal activities will be conducted will have curtained doorways to further minimize air passage into non-regulated areas. The Contractor will also be responsible to make all required notifications to trades or other building occupants in areas adjacent to regulated abatement work areas.

3.1.7.15 Emergency Exits: The Contractor shall establish emergency and fire exits from the Work Areas, or establish alternative exits satisfactory to the County and to local emergency authorities or other applicable agencies.

All exits leading out of regulated work areas shall be marked in bold lettering "EXIT" or "Emergency Exit." Exit markings shall be in the primary language(s) appropriate to communicate with the workers present in the work area.

3.1.7.16 Work Area Communications: The Contractor will be responsible for establishing and maintaining clear communications between the personnel in the work area(s) and those stationed outside, such that those communications can be maintained without need for workers to perform an exit from the work area that would require decontamination.

3.1.7.17 Work Area Viewing Windows: The Contractor will provide and construct observation windows into all regulated work area containments. The viewing windows will be of a visually transparent material of approximately 18”(H) x 24”(W) in size and/or will be constructed and maintained so as to allow unobstructed observation of the entire work area from outside the containment.

3.1.7.18 Differential Air Pressure: Prior to the start of asbestos removal work, the Contractor will install HEPA-filtered differential air pressure equipment (also known as “exhaust fan units” or “negative air machines”), as specified herein, to maintain a diminished air pressure differential within the Work Area. These exhaust fan units will remain in place within a regulated Work Area throughout the abatement and decontamination phases of the Work until the required visual and/or clearance air testing has been satisfactorily achieved. A minimum pressure differential of -0.03 inches of water column (-0.03” w.c.), with respect to the air pressure of the area outside a Work Area, will be established and must be maintained at all times within all regulated Work Areas. The Contractor shall have sufficient auxiliary units on-

site and/or in place to maintain this requirement throughout the Work. Air exhausted from this equipment shall be exhausted to the outdoors and, to the extent feasible, away from occupied areas around the building. Documentation of satisfactory differential air pressure shall require the use of a manometer, as specified herein. If, in the opinion of the Project IH Consultant, the differential air pressure units are judged to be in need of maintenance or in any other way fail to meet typical industry standards, the units shall not be placed into operation on this project.

3.1.7.19 Pre-Abatement Work Area Inspections: Prior to the start of asbestos removal work, the Contractor, accompanied by the Project IH Consultant, will conduct a detailed inspection of all equipment and Work Area isolation preparations to assure that appropriate engineering controls are in place and are functioning sufficiently to contain asbestos fibers to within the Work Area. The concurrence of the Project IH Consultant will be required to determine that a Work Area has undergone adequate preparation to proceed with asbestos removal work. A Pre-Abatement Work Area inspection will be conducted for each regulated Work Area and each individual inspection must be documented in writing. Such documentation will be signed by the individual(s) conducting the inspection. A copy of each such documentation will be obtained by the Project IH Consultant for conveyance to the County.

3.2 ASBESTOS REMOVAL

3.2.1 All materials with detectable concentrations of asbestos that are scheduled for removal shall be removed from the building. The types of materials known to be present are summarized in Section 1.1.1 of this document.

3.2.2 Work Practices:

3.2.2.1 At all times, the Contractor will employ work practices intended to maintain an orderly and safe work place. This will include, but not be limited to: pre-cleaning the work area; adequately wetting ACCM or ACM prior to its disturbance and during its removal; prompt clean-up of ACCM or ACM waste; use of HEPA-filtered vacuums and exhaust fan units; and employing all feasible engineering controls necessary to prevent elevated airborne asbestos concentrations within and outside of the Work Area(s).

The Project IH Consultant may collect air samples during the project to document airborne fiber levels inside the Work Area(s) and in locations outside the Work Area(s). The Contractor will be required to take immediate corrective action if perimeter samples exceed 0.01 fibers/cubic centimeter (f/cc) by PCM analysis, are overloaded, or exceed 70 structures/square millimeter (s/mm^2) by Transmission Electron Microscopy (TEM).

3.2.2.2 OSHA Class I Asbestos Work: Materials designated for removal as OSHA Class I Asbestos Work will be removed in full compliance with the Class I work practices (i.e., Methods of Compliance) prescribed in Cal-OSHA's Construction Safety Orders for Asbestos (8 CCR §1529, et. seq.). All ACM or ACCM designated for removal as Class I Asbestos Work will likewise be removed in full compliance with the BAAQMD's Regulation 11, Rule 2. Class I Asbestos Work may not commence until the work area(s) is/are prepared in accordance with section 3.1.7.8. (or, in the case of TSI removal by "Wrap and Cut" method, 3.1.7.9.) of this Specification section.

3.2.2.3 OSHA Class II Asbestos Work: Floor tiles, mastics, and other materials designated for removal as OSHA Class II Asbestos Work will, at a minimum, be removed in full compliance with the Class II work practices (i.e., Methods of Compliance) prescribed in Cal-OSHA's Construction Safety Orders for Asbestos (8 CCR §1529, et. seq.). All ACM or ACCM designated for removal as Class II Asbestos Work will likewise be removed in full compliance with the BAAQMD's Regulation 11, Rule 2. Class II materials should, to the extent feasible, be removed with hand tools, so that they might remain substantially intact. Class II Asbestos Work may not commence until the work area(s) is/are prepared in accordance with section 3.1.7.10. At the discretion of the Project IH Consultant, use of mechanical or motorized removal methods may be permitted, provided the proposed method(s) is/are not prohibited under Cal-OSHA or BAAQMD work practices. Class I work practices may be utilized to perform Class II work. **Floor tile and/or floor tile mastic removal operations involving the use of mechanized work methods, including motorized floor buffers, must be conducted utilizing OSHA Class I Work Area Isolation methods and engineering controls as described in section 3.1.7.8 of this Specification section. This includes preparing the Work Area(s) in accordance with BAAQMD requirements for the removal of RACM.** ACM shall be wetted prior to and during its removal, handling, and waste disposal. Low-odor, solvent-based mastic removers may be used to remove ACM mastics, provided the product(s) meets the requirements of Section 2.1 – MATERIALS of this Specification, and provided the waste generated by their use is managed in accordance with applicable state and federal regulations.

3.2.2.4 Work Area Regulation: All asbestos removal Work Areas shall be regulated to prevent unauthorized entry. Isolation methods shall include, but not necessarily be limited to: the use of barrier tape (yellow "Caution" and/or OSHA's "Danger Asbestos") and OSHA's "Danger Asbestos" sign(s). The Contractor shall maintain a daily Work Area entry/exit log and require all persons entering the Work Area to sign in and out. The Contractor will bear sole responsibility for controlling entry into the Work Area(s).

3.2.3 Work Area Decontamination

3.2.3.1 Initial Cleaning: Clean-up and containerization of ACCM or ACM waste will be an on-going activity throughout the Work. ACCM or ACM gross debris must not be allowed to accumulate within the Work Area for subsequent clean-up. ACM must be wetted and kept wet throughout the removal and clean-up work. All uncontained ACM waste must, at a minimum, be bagged and sealed in leak tight containers by the end of each day's work shift. Containerized waste may be stored within the Work Area during the work, but must be removed from the Work Area for storage in a secured location on a periodic basis. All containerized waste must be removed from the regulated Work Area prior to conducting visual inspections. In no event may the accumulation of containerized waste within the Work Area be allowed to impede the work progress or compromise work site safety.

3.2.3.2 Containerization of Waste: Unless otherwise authorized, ACCM or ACM waste will be containerized in rigid primary waste containers (boxes, drums, bins, etc.) suitable for loading, temporary storage, transit, and unloading of asbestos waste without rupture, or otherwise causing exposure to persons or releases to the atmosphere. Rigid primary containers must be lined with a leak tight barrier of poly sheeting or

poly bags of minimum thickness of 6 mil. Waste containerized in bags will be double-bagged, evacuated of air, "goose-necked" and sealed with duct tape. All containers used for disposal of asbestos-containing waste must be labeled in general accordance with applicable regulations, including the requirements of 8 CCR 1529 (k) (8) and BAAQMD Regulation 11, Rule 2.

3.2.3.3 Detail Cleaning: Following gross removal of ACM or ACCM, any remaining substrate surface is to be detail cleaned using a combination of hand tools (scrapers, wire brushes, etc.), wet-wiping, and HEPA vacuuming. The substrate and containment will be considered to be adequately cleaned when no visible and no three-dimensional remnant of the ACM or ACCM can be seen or felt. This determination will be made by the Project IH Consultant on a case-by-case basis. In no event may encapsulation of residual ACM or ACCM be used in lieu of detail cleaning. Complete removal of an asbestos-impregnated porous substrate is an acceptable method of removal, so long as doing so does not introduce additional hazards into the Work Area, and with the additional requirement that the entire removed material be treated for disposal purposes as ACM or ACCM. See section 3.1.7.12. of this Specification section for additional requirements.

3.2.3.4 Waste Load Out: Prior to the removal of containerized waste from the Work Area, each container is to be wet-wiped to remove any residual asbestos contamination. Double-bagging of waste must be completed within the regulated Work Area and the exterior of each bag or container must be individually wet-wiped prior to removal from the Work Area. Waste will be loaded out of the Work Area through the equipment decontamination ("waste load out") chamber and <u>not</u> through the personal decon. Once outside of the Work Area, the waste will be transported in rigid movable bins, wheelbarrows or comparable directly to a secured waste storage location approved by the County. With the exception of County approval, waste is not to be stored within the building.

3.2.3.5 Post-Abatement Work Area Inspections: Subsequent to the completion of the cleaning phases and waste load-out, the Contractor's Supervisor, accompanied by the Project IH Consultant, will conduct a detailed visual inspection of the Work Area to assure that the identified asbestos has been removed and that the Work Area has been adequately cleaned. The concurrence of the Project IH Consultant will be required to determine that a Work Area has undergone adequate cleaning. This Post-Abatement Work Area inspection will be conducted for each regulated Work Area and each individual inspection must be documented in writing. Such documentation will be signed by the individuals conducting the inspection(s). A copy of each such documentation will be obtained by the Project IH Consultant for conveyance to the County. Prior to conducting a Post-Abatement Work Area inspection, the Contractor will remove and replace the primary filter ("pre-filter") on each differential air pressure unit ("negative air machine"). All non-essential equipment is to be decontaminated, as described herein, and removed from the Work Area prior to commencing the Post-Abatement Work Area Inspection.

3.2.3.6 Equipment Decontamination: Prior to removal from a Work Area, the Contractor will decontaminate all tools and equipment. Decontamination will include, but not be limited to: wet-wiping, HEPA-vacuuming, and containerizing tools into subsequently decontaminated containers. Prior to removal from the Work Area, HEPA-filtered vacuum cleaners will be emptied of debris, wet-wiped and wrapped, bagged or

otherwise containerized for transport from the Work Area. Likewise, differential air pressure equipment is to be sealed with poly sheeting and tape, and externally decontaminated before removal from the Work Area. All equipment will be subject to inspection by the Project IH Consultant prior to its demobilization from a regulated work area.

3.2.3.7 Encapsulation: Upon successful compliance with the requirements for Post-Abatement Work Area Inspection, and unless otherwise specified, the Contractor shall apply a "lock-down" encapsulant to all surfaces within the contained Work Area. The encapsulant must be compatible with the existing surfaces. Following application of the encapsulant, a sufficient amount of time must pass to allow for the encapsulant to dry. The Contractor should plan, at a minimum, to allow for an extended (preferably overnight) drying period. In all instances, the decision as to whether an adequate drying period has elapsed will be at the discretion of the Project IH Consultant.

3.2.3.8 Poly Removal: Once satisfactory Post-Abatement Work Area Inspections have been documented and after any applied encapsulant has been allowed to dry, the Contractor will remove the top layer of plastic on the walls, floors, and/or ceilings (as appropriate). The inner plastic layer (if present) and primary isolation barriers (i.e. "critical barriers") on vents, grilles, diffusers, etc., are to remain in place for the clearance air sampling. Care should be taken to avoid pulling down any remaining layer(s) of plastic sheeting. In Work Areas where a single layer of plastic has been used on the walls, floors, and ceilings (where applicable), that plastic layer shall be removed and critical barriers are to remain in place until air clearance sampling is completed and satisfactory air clearance criteria have been met. No alternative approaches are to be implemented without the prior agreement of the Project IH Consultant. The Contractor will containerize removed plastic and any remaining debris, decontaminate the containers, and dispose of as ACM-contaminated waste. All other isolation engineering controls including decontamination facilities are to remain in place until the specified air clearance testing criteria have been met. **Removal of plastic layers and isolation engineering controls ("teardown") may not occur without the knowledge and consent of the Project IH Consultant.**

3.2.4 Personal Protection

3.2.4.1 General: The Contractor is solely responsible for the safety, efficiency, and adequacy of his work, workers, equipment and methods, and for any damages which may result from their inappropriate actions, practices, construction, maintenance, or operations. The Contractor will erect and maintain at all times, as required by the condition and progress of the Work, proper safeguards for the protection of the workers and the public, including the posting of appropriate and applicable warning signage on the site.

3.2.4.2 Competent Person: The Contractor will designate a responsible member of its organization to be present on the work site, whose duty shall be the detection, recognition, and prevention of accidents and potential accidents. The designated individual will assume and fulfill the duties of the Competent Person, as defined in 8 CCR §1529 et. seq. In the absence of notice to the contrary, provided in writing to the Project IH Consultant, this person will be the on-site Supervisor or Foreman of the Asbestos Abatement Contractor.

3.2.4.3 Toxic Exposure Responsibility: To the extent allowable by law, the Contractor assumes all responsibility for any toxic exposures or effects experienced by workers as a result of the air quality supplied to respirators. The Contractor will assume all responsibility for any toxic exposures or effects to all personnel or property caused by airborne particulates, mists, vapors, or any wetting agent(s), or hazardous substances, and for the legal disposal of said substances and/or any residual toxic residues. Commencement of the Work by the Contractor will constitute implied acceptance of these responsibilities.

3.2.4.4 Worker Discipline: The Contractor will at all times establish and maintain discipline and good order over its employees. The Contractor will not employ on the work crew any person not skilled in the Work assigned, nor anyone who has not received notice and instructions in the dangers of asbestos exposure, and in the methods of reduction of the dangers associated with its disturbance. Workers must also receive training in the proper use of respirators, safety procedures, equipment, protective clothing, and appropriate work procedures. The Contractor will remove any employee from the job site failing to adhere to any standard or requirement set forth herein.

3.2.4.5 Work Crew Size: The Contractor is responsible for setting the size of its work crew(s), subject to the conditions stated in this paragraph. During asbestos removal operations, a minimum of two (2) workers must be in a work area at any time. No worker shall be allowed to work alone in a regulated work area. Under no circumstances may workers within a regulated work area be allowed to work without the supervision of an on-site foreman. The crew size on any given day shall be adequate to progress and/or complete the Work in accordance with the established Project Schedule.

3.2.4.6 Respiratory Protection: Prior to commencement of work, all workers must be instructed and must be knowledgeable in the use of respiratory protective equipment. All respiratory protection is to be provided to workers in conjunction with a respiratory protection program which shall meet the requirements of Cal-OSHA 8 CCR §5144 et. seq. and 8 CCR §1529 et. seq. This includes, but is not limited to, qualitative or quantitative fit testing. The following additional requirements shall apply:

3.2.4.6.1 The Contractor will provide its workers with respiratory equipment approved by the National Institute for Occupational Safety and Health (NIOSH) for use in atmospheres containing asbestos fibers. Respiratory protection will be issued to each worker for their sole and individual use. Respiratory protection will be worn by all on-site personnel entering into a regulated Work Area or who may otherwise be potentially exposed to asbestos. Respiratory protection is to be worn at all times when inside a regulated Work Area, as well as during personal decontamination.

3.2.4.6.2 Where respirators with disposable filters are employed, the Contractor will provide sufficient filter cartridges for replacement as necessary by the worker, or as required by the applicable regulation.

3.2.4.6.3 The Contractor will supply all its employees with adequate respiratory protection, to meet the minimum standards of the applicable Cal-OSHA requirements. In accordance with 8 CCR §1529 et. seq., the Contractor

will have a Competent Person conduct exposure assessments and periodic monitoring to establish the minimum appropriate respiratory protection to be used and the effectiveness of the chosen respiratory protection. In the absence of data acceptable to the Project IH Consultant as satisfying the requirements for a Negative Exposure Assessment [8 CCR §1529(b)], the Contractor must conduct Initial Exposure Assessments, as defined in 8 CCR §1529(f)(2). In addition, the Contractor will require and enforce the use of the following activity-related requirements:

(a) Work involving the use of solvents or volatile organic compounds shall be conducted with the use of air purifying respirators equipped with HEPA and Organic Vapor cartridges.

(b) Any question as to respiratory protection requirements for any activity unnamed or not otherwise described herein shall, by default, require the maximum protection.

(c) Appropriate respiratory equipment will be used throughout the project, including during the removal of final layers of plastic after final air clearance is attained.

(d) The minimum respiratory protection to be used during Class I asbestos removal will be powered air-purifying respirators (PAPRs).

3.2.4.6.4 The Contractor shall post in the Equipment Room and the Clean Room, all decontamination and safety procedures to be followed for ingress and egress from a regulated work area.

3.2.4.7 Protective Clothing: The Contractor is to provide workers with sufficient sets of hooded, disposable, full-body coveralls recommended for use in asbestos operations equivalent to DuPont "TYVEK-Type 14". Such full body protective clothing will include, but not be limited to:

3.2.4.7.1 Foot coverings including safety shoes or boots, and/or disposable foot coverings.

3.2.4.7.2 Protective head coverings (hard-hats).

3.2.4.7.3 Protective clothing should be hooded, full-body coverall type.

3.2.4.7.4 Durable water-proof gloves (plastic, latex, rubber, nitrile, etc.) selected for chemical compatibility of the glove material and the liquid materials to be handled. Cloth or leather gloves may also be worn for comfort, but are not to be worn alone when handling hazardous liquids.

3.2.4.8 Additional Clothing Requirements: The Contractor will observe the following additional work clothing requirements:

3.2.4.8.1 Street clothes may not be worn under protective clothing into a regulated work area.

3.2.4.8.2 Any non-decontaminated protective clothing must remain within the contaminated areas, and will be disposed of as asbestos-contaminated waste upon completion of its use.

3.2.4.8.3 Provide authorized visitors with disposable sets of protective full-body clothing including footwear, as needed.

3.2.4.8.4 Provide eye protection and hard hats as required for job conditions or by applicable safety regulations. Where negative pressure respirators are worn, they are to be full-faced, unless the Contractor also provides protective eye wear.

3.2.4.8.5 All clothing must be sealable by design and/or by securing with tape at the workers' ankles and wrists. Short pants or short sleeve shirts will not be allowed for primary clothing in the work area.

3.2.4.9 Personal Exposure Monitoring: It is the Contractor's responsibility to conduct required personal exposure monitoring. Such exposure monitoring must be in full compliance with the requirements of 8 CCR §1529, et. seq. and 8 CCR §5144, et. seq. The Contractor will monitor the airborne asbestos exposures of not less than 10% of the work crew, or a minimum of two (2) workers, whichever is greater. Workers will be monitored in "worst case scenario" tasks, as well as those conducting less hazardous work. Personal exposure monitoring is not the responsibility of the County, nor of the Project IH Consultant, however, the Project IH Consultant may elect to conduct such monitoring as a supplemental or quality assurance measure. Personal exposure monitoring conducted by the Project IH Consultant is not to be construed as a substitute for, nor in any way to obviate, the Contractor's duty to conduct such monitoring. Personal exposure monitoring for asbestos will be conducted and analyzed in accordance with NIOSH Method 7400. Analytical results of Contractor's personal exposure monitoring must be posted daily at the work site, and copies of the analyses are to be submitted to the County along with the Post-Job Submittals.

3.2.5 Waste Management And Disposal

3.2.5.1 General: The Contractor is responsible for the safe handling, packaging, labeling, storage and transportation of all asbestos-containing waste (hazardous and non-hazardous) generated by the Work. By commencing this work, the Contractor implicitly agrees to bear all costs arising from any claims, damages, losses, and/or clean-up expenses incurred which as a result of the Contractor's negligence result from an asbestos release(s) on the job-site or while asbestos waste is in transport to a waste disposal facility. The Contractor and/or its designated subcontract waste hauler will deliver all asbestos-containing waste materials to an appropriately designated waste disposal facility that has been accepted by the County and which is permitted in accordance with applicable regulations.

3.2.5.2 Storage Facilities: The Contractor will assure that all asbestos-containing wastes (hazardous and non-hazardous) generated by the Work are stored in a secured manner until received at the waste disposal facility. Debris bins, storage enclosures, etc. must be locked overnight, and whenever the Contractor is off-site or unable to directly monitor their contents and management. The Contractor will ensure that the

appropriate and required warning signs are posted on waste storage locations. The Contractor will be responsible to maintain the waste storage facilities in an orderly and well-kept condition at all times. The Contractor will conduct routine waste storage area inspections to assure that appropriate storage conditions are maintained. Waste is not to be co-mingled with stored non-waste material or equipment.

3.2.5.3 Off-site Shipment of Wastes: The Contractor will notify the County and the Project IH Consultant in advance, whenever asbestos-containing waste materials are to be removed from the Project site. A copy of the Uniform Hazardous Waste Manifest or any other documents required by State or Local agencies shall be completed by the Contractor and submitted to the Project IH Consultant for review and signature prior to transporting asbestos-containing waste materials to a disposal facility. The Contractor shall provide sufficient advance notice of the need to obtain manifest signatures, so as to not delay waste shipment or otherwise impede the Project Schedule. The Project IH Consultant shall have authority to sign or approve waste shipping documents on behalf of the County. It shall be the Contractor's responsibility to obtain the necessary authorized signature(s) to ship wastes off-site. Delays or expenses resulting from the untimely coordination of waste shipment documentation shall be borne by the Contractor.

3.2.5.4 Waste Shipment Documentation: EPA Uniform Hazardous Waste Manifest forms will be used for all waste transported off-site for hazardous waste disposal. An asbestos non-hazardous waste tracking manifest will be used for all asbestos-containing waste transported off-site for disposal as non-hazardous waste. The Contractor will submit original "Generator" copies of all hazardous and non-hazardous waste manifests to the Project IH Consultant at the time the waste is transported off-site for disposal. All waste tracking documentation must meet the requirements of BAAQMD Regulation 11, Rule 2 (sections 11-2-304.6 and 11-2-502). All waste loads removed from the Project Site shall either be weighed by a Certified Weigh master prior to delivery to the disposal facility or at the disposal facility. Weight tickets shall be submitted by the Contractor as a part of the Contractor's Post-Job Submittals. At the conclusion of the Work, the Contractor shall provide documentation that the asbestos-containing waste materials were disposed of at an appropriate EPA-approved waste disposal facility. The documentation shall be submitted as part of the Contractor's Post-Job Submittals.

3.2.5.5 Shipment Containers: All waste shipping containers shall be individually labeled with appropriate signage and warnings, as required by applicable regulations, codes and ordinances. All waste hauling vehicles and/or waste debris bins shall, at all times, be enclosed and sealed while in route to the disposal facility.

3.2.5.6 Non-friable Debris Disposal: Resilient floor tiles, roofing materials and other non-friable asbestos-containing materials will not be required to be disposed of as hazardous waste, unless they are made friable during the removal process (see Definitions for description of friability.) Friability will be determined by the Project IH Consultant or by a representative of a regulatory agency.

3.2.6 Work Area Clearance Criteria

3.2.6.1 General: The Contractor is not to de-mobilize from any Work Area until both the visual clearance criteria and the air monitoring clearance criteria have been met and documented, as described herein.

3.2.6.2 Post-Abatement Work Area Inspections: Subsequent to the completion of the cleaning phases and waste load-out, the Contractor's Supervisor, accompanied by the Project IH Consultant, will conduct a detailed Post-Abatement Work Area Inspection (visual inspection) to assure that the identified asbestos has been removed and that the Work Area has been adequately cleaned. The concurrence of the Project IH Consultant is required to conclude that a Work Area has undergone adequate cleaning to proceed with clearance air testing. This Post-Abatement Work Area inspection will be conducted for each regulated Work Area and each individual inspection is to be documented in writing. Such documentation will be signed by the individuals conducting the inspections. A copy of each such documentation will be provided to the Project IH Consultant for conveyance to the County.

3.2.6.3 Visual Clearance Criteria: A Work Area will be considered to be adequately cleaned when no visible and no three-dimensional remnant of the ACCM or ACM can be seen or felt. This determination will be made by the Project IH Consultant on a case-by-case basis.

3.2.6.4 Air Clearance Testing: Once a Work Area has successfully achieved the Visual Clearance Criteria; has been encapsulated; and the encapsulant has been allowed to adequately dry, the Project IH Consultant will conduct Air Clearance Testing to evaluate the Work Area's cleanliness and suitability for unprotected human re-occupancy. Clearance air sampling will be conducted in general accordance with AHERA protocols (40 CFR 763 Subpart E) for analysis by Transmission Electron Microscopy (TEM), although other TEM analytical methods (e.g. Yamate II) may be employed at the discretion of the Project IH Consultant. Unless otherwise specified, air sample collection will be conducted by aggressively disturbing the air prior to and during the clearance air sample collection period. At the discretion of the Project IH Consultant, some Work Areas may be evaluated by Air Clearance Testing using PCM in accordance with the NIOSH 7400 Method. Clearance air samples will not be collected outside the work area for comparison purposes. Satisfaction of the Air Clearance Criteria will be based solely the analytical results obtained from clearance air testing conducted within a regulated Work Area.

3.2.6.5 Air Clearance Criteria: A Work Area will be judged to be adequately cleaned and suitable for unprotected human re-occupancy when the asbestos structure concentration of each of the air samples collected within the Work Area, as analyzed by TEM, is reported to be less than 70 s/mm^2 of sample filter media. In Work Areas where Air Clearance Testing is conducted for analysis by PCM, a Work Area will be judged to be adequately cleaned and suitable for unprotected human re-occupancy when each sample collected within the Work Area is reported to be less than 0.010 fibers per cubic centimeter of air sampled (<0.01 f/cc).

3.2.6.6 Failure to Achieve Clearance Criteria: Should the Contractor fail to achieve either the Visual Clearance Criteria or the Air Clearance Criteria within a Work Area, the Contractor will repeat a thorough re-cleaning of the entire Work Area. Following completion of the re-cleaning, the visual Post-Abatement Work Area Inspection will be repeated and documented again. Once the re-cleaned Work Area has successfully achieved the Visual Clearance Criteria, the Project IH Consultant will repeat the Air Clearance Testing. This pattern will be repeated until both Visual Clearance Criteria and Air Clearance Criteria have been achieved in the Work Area. All costs associated to the initial re-cleaning, and any subsequent re-cleaning, re-inspection, and/or re-sampling and analyses, will be borne by the Contractor as re-work.

END OF SECTION

ATTACHMENT - A

CERTIFICATE OF ASBESTOS WORKER'S ACKNOWLEDGEMENT

Project Name: _____

Date: _____

Project Address: _____

Contractor's Name: _____

WORKING WITH ASBESTOS CAN BE DANGEROUS. INHALING ASBESTOS FIBERS HAS BEEN LINKED WITH VARIOUS TYPES OF CANCER. IF YOU SMOKE AND INHALE ASBESTOS FIBERS THE CHANCE THAT YOU WILL DEVELOP LUNG CANCER IS GREATER THAN THAT OF THE NON-SMOKING PUBLIC.

Your employer's contract with the Owner of the above project requires that: You must be supplied with the proper respirator and be trained with its use. You must be trained in safe work practices and in the use of the equipment found on the job. You must receive a medical examination. These things are to have been done at no cost to you.

RESPIRATORY PROTECTION: You must have been trained in the proper use of respirators, and informed of the type of respirator to be used on the above referenced project. You must be given a copy of the written respiratory protection manual issued by your employer. You must be equipped at no cost with the respirator to be used on the above project.

TRAINING COURSE: You must have been trained in the dangers inherent in handling asbestos and breathing asbestos dust and in proper work procedures and personal area protective measures. The topics covered in the course must have included the following:

- Physical characteristics of asbestos
- Health hazards associated with asbestos
- Respiratory protection
- Use of protective equipment
- Pressure Differential Systems
- Work practices including hands on or on-job training
- Personal decontamination procedures
- Air monitoring, personal and area

MEDICAL EXAMINATION: You must have had a medical examination within the past 12 months at no cost to you. This examination must have included: health history, pulmonary function tests, and may have included an evaluation of a chest x-ray.

By signing this document you are acknowledging that you have been advised of your rights, as pertain to training and protection, and of the worker protection requirements applicable to your employer, the Contractor.

Signature: _____

Social Security No.: _____

Printed: _____

Name: _____

Witness: _____

ATTACHMENT - A

CERTIFICADO DE RECONOCIMIENTO POR PARTE DEL TRABAJODOR

NOMBRE DEL PROYECTO: _____

FECHA: _____

DIRECCION DEL PROYECTO: _____

NOMBRE DEL CONTRATISTA: _____

TRABAJAR CON ASBESTO PUEDE SER PELIGROSO. EL ASPIRAR DE FIBRAS DE ASBESTO HA SIDO LIGADO CON VARIOS TIPOS DE CANCER. SI UD. FUMA Y ASPIRA FIBRAS DE ASBESTO, LAS POSIBILIDADES QUE UD. SUFRIRA DE CANCER SON MAYORES QUE PARA LA PERSONA QUE NO FUMA.

El contrato entre su patron y el dueno para el proyecto antes citado requiere que le proveen a Ud. un repirador adecuado, y que a Ud. lo entrenen en su uso; que le entrenen a Ud. en praticas de seguridad en la obra y en el uso del equipo que se encuentre en la obra; que Ud. reciba un examen medico, y que todo esto se haga sin costo para Ud.

PROTECCION RESPIRATORIA: Ud. tiene que haber sido entrenado en el uso correcto de respiradores, y informado acerca del tipo de respirador que se usara en la obra citada. Deberan entregarle a Ud. una copia escrita del manual de proteccion respiratoria, expedida por su patron. Ud. tiene que ser equipado, sin costo alguno, con el respirador que se usara en la obra citada.

CURSO DE ENTRENAMIENTO: Ud. tiene que haber sido entrenado en los peligros inherentes en el manejo de asbesto y en el aspirar polvo de asbesto, asi como en los procedimientos correctos en el trabajo y las medidas de proteccion para el individuo y para la zona. Las materias tratadas en el curso deberan haber includido las sigientes:

- Caracteristicas fisicas del asbesto
- Peligros a la salud asociados con el asbesto
- Proteccion repiratoria
- El uso de equipo de proteccion
- Sistemas de Presion Diferencial
- Praticas del trabajo, incluyendo experiencias en actividades reales del trabajo
- Procedimientos para la decontaminacion personal
- Revision del aire ambiental en una area y para el individuo

EXAMEN MEDICO: Usted debe haber tenido un examen médico en el plazo de los últimos 12 meses sin coste a usted. Esta examinación debe haber incluido: la historia de la salud, pruebas de función pulmonares, y pudo haber incluido una evaluación de una radiografía del pecho.

Firmando este documento usted está reconociendo que le han aconsejado de las sus derechas, como pertenece al entrenamiento y a la protección, y de los requisitos de la protección del trabajador aplicables a su patrón, el contratista.

Firma: _____

Numero de Su Seguro social: _____

Su nombre, en letras de molde: _____

Testigo: _____

ATTACHMENT - B

CERTIFICATE OF COMPETENT PERSON ACKNOWLEDGMENT

The Cal/OSHA Construction Safety Orders for asbestos-related work (8 CCR, §1529, et. seq.) outlines specific duties and qualifications of the "Competent Person." An overview of these qualifications and responsibilities are summarized below.

The competent person must be authorized by his or her employer to take prompt corrective measures to eliminate hazards on the job and protect workers' safety.

The competent person must be capable of:

- Identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees.
- Identifying existing asbestos hazards in the work place and selecting the appropriate control strategy for asbestos exposure.

The duties of the competent person includes, but are not limited to:

- Frequent and regular inspections of the job site, materials, and equipment.
- Supervise or perform the set-up of the regulated area and/or containment.
- Ensure the integrity of the regulated area and/or containment.
- Set up procedures to control entry to and exit from the regulated area and/or containment.
- Supervise all employee exposure monitoring and assure it is conducted according to regulatory requirements.
- Ensure the employees working within the regulated area(s) wear respirators and protective clothing as required by regulation.
- Ensure that employees working set up, use, and remove engineering controls, and use work practices and personal protective equipment in compliance with the regulations.
- Ensure that employees use hygiene facilities and observe the decontamination procedures specified in the regulation.
- Ensure through continuing onsite surveillance that engineering controls are functioning properly and employees are using proper work practices.
- Ensure that notification requirements of the regulation are met.

Additionally, the EPA requires the competent person to be trained in the Federal NESHAP regulations, the means to comply with them, and be on site during all removal operations.

I hereby certify that I have the authority to take prompt corrective measures to eliminate hazards on the job and protect workers safety. Furthermore, I certify that I have read and understand my duties as outlined above and under the applicable regulations, and that I will exercise them to the best of my ability.

Employer: _____

_____ _____
Signature of Competent Person Date

_____
Printed Name of Competent Person

DOCUMENT 01 81 10

LEAD HAZARD CONTROL

PART 1 - GENERAL

1.1 SUMMARY

1.1.1 Scope of Work: Except as otherwise expressly provided herein, the Lead Hazard Control Contractor will supply all labor, supervision, materials, equipment, tools, services, insurance and each and every item of expense necessary for the control of lead hazards resulting from the disturbance of lead-containing materials. Work impacting lead-containing materials shall comply with all applicable federal, state and local requirements and the requirements of this specification.

Limited lead sampling has previously been completed and is provided in Appendix A - Previous Survey Reports and Sampling Data. Results of sampling indicated that many painted surfaces were found to contain lead. Use of the reports and sampling data is subject to the limitations set forth in Document 00 31 19 – Existing Conditions Information.

The intent of Lead Hazard Control work described herein is to control lead hazards that might be generated during the removal or disturbance of materials and equipment that may contain lead. The intent of this specification section is to stipulate engineering control options, work practices, and performance criteria that, if properly implemented, should minimize the likelihood of exposing personnel or the environment (air, soil or groundwater) to lead hazards. **Lead related Work for this job may include but is not limited to stabilization (scraping loose and peeling paint), paint stripping, and painting over lead-containing paint.**

1.1.2 Applicability: Except as may otherwise be provided for, the requirements of the Lead Hazard Control Contractor will apply to the General Contractor and, by extension, to all their subcontractors engaged in "lead-related construction work", as defined herein, or other work involving the disturbance of lead-containing coatings or materials. Consequently, all those who engage in lead-related construction, whether individually or working in cooperation with others, may be designated as a Lead Hazard Control Contractor. This broad applicability is in accordance with existing regulations promulgated by the California Division of Occupational Safety and Health ("Cal-OSHA") and by the California Department of Public Health (CDPH). To the extent allowable by law, the County of Alameda (herein after referred to as the "County") will be the sole and final arbiter of which contractor(s) or subcontractor(s) qualify on this Project Site as a Lead Hazard Control Contractor (hereinafter referred to as the "Contractor").

1.1.3 Lead-Containing Materials: Lead-containing materials identified herein and as may be subsequently revealed during Work will be managed by the Contractor in accordance with all applicable federal, state and local laws/regulations/guidelines, and the requirements of this Specification,

1.1.4 Project IH Consultant: The County's Industrial Hygiene Consultant (hereinafter referred to as the "Project IH Consultant") will provide independent, third-party industrial hygiene consulting services on behalf of the County. Such services may or may not include conducting on-site work observations, materials or environmental testing, and/or consulting with the County. It is not the responsibility of the Project IH Consultant to supervise the Contractor; nor to direct the Contractor's work effort; nor to assume the management of, or responsibility for, the Contractor's health and/or safety practices, nor

its waste management, nor its regulatory compliance. At all times, the Contractor shall be solely responsible for the quality and execution of all phases and aspects of the Work.

1.2 SUBMITTALS

1.2.1 General:

1.2.1.1 In addition to any other contractual submittals required of the Contractor, the Contractor will provide the submittals described in this Specification section. Submittals will be reviewed by both the County and the Project IH Consultant for acceptability. The Project IH Consultant will either recommend submittals to the County for acceptance, or will return them to the County as deficient, with notations for correction and re-submission. The Project IH Consultant does not have authority to "approve" submittals.

1.2.1.2 Documents submitted by the Contractor in an effort to comply with the requirements of this Specification section are to be separate and distinct from any other submittals provided to comply with other Specification sections. In attempting to satisfy the requirements of this Specification section, the Contractor must submit only those documents specifically requested to fulfill the specified requirements. Extraneous documentation will be rejected, but not returned.

1.2.1.3 Except as otherwise noted herein, the submittals required in this Specification section are required only of the Contractor(s) determined by the County to have primary responsibility for disturbing or removing the lead-containing materials identified herein. At the discretion of the County, other contractors or subcontractors may subsequently be required to provide all or part of the submittals required in this section.

1.2.2 Schedule And Format:

1.2.2.1 Delivery: Submittals listed in this section must be delivered to the County.

1.2.2.2 Quantity: Six (6) identical, legible copies of each submittal listed in this section shall be delivered in an organized fashion suitable to the County for review. One (1) copy will be conveyed by the County to the Project IH Consultant for review.

1.2.2.3 Work Commencement: No portion of the Work shall be commenced by the Contractor until the submittals are reviewed and accepted by the County.

1.2.2.4 Delays: Delays to the Work resulting from the submittal of deficient or illegible documentation, or from the untimely submittal of potentially acceptable documentation, shall be the sole responsibility of the Contractor. Except as otherwise granted by the County, no extensions will be made to the awarded contract schedule or budget to accommodate such delays.

1.2.2.5 Format: Submittals will be provided in 8-1/2" x 11" format with sections separated by numbered tabs indexed to a printed Table of Contents. Illegible submittals will be considered deficient and returned for correction.

1.2.2.6 Schedule: Submittals delivered to the County will observe and conform with the following timetable:

1.2.2.6.1 Pre-work Submittals - Not less than ten (10) business days prior to the Contractor's mobilization onto the work site, the Contractor will deliver legible copies of the specified documents. The Project IH Consultant will review submittals and return deficient submittals to the County within five (5) business days following their receipt by the Project IH Consultant. Deficient submittals shall be corrected and resubmitted by the Contractor within five (5) business days of their return. Once accepted, the reviewed copy shall be returned to the Contractor, who shall maintain a copy of the accepted submittal at the work site.

1.2.2.6.2 Product Submittals - Not less than ten (10) business days prior to the date of intended use of the product on the work site.

1.2.2.6.3 Post-work Submittals - Except as otherwise specified herein, the Contractor shall, within twenty (20) business days following demobilization from the project site, submit 2 copies of the Post-work Submittals listed in this section. If the Project IH Consultant or the County determines that the Post-work Submittals are unacceptable, the Contractor will be required to correct the deficiencies and re-submit them for review.

1.2.3 Pre-Work Submittals:

1.2.3.1 Progress Schedule: Provide a proposed work schedule indicating the following items:

1.2.3.1.1 Indicate the sequence of the lead-related work by activity and the sequencing of lead-related work within each building, on each floor, and for each regulated area.

1.2.3.1.2 Show the dates for beginning and completion of each major element (work area set-ups, paint removal/stabilization, detail cleaning, preliminary visual inspections, final visual inspections, tear-down, etc.) of the lead-related work, including substantial completion dates for each building, on each floor, and for each regulated work area. Update as necessary.

1.2.3.1.3 Provide anticipated manpower distribution per scheduled activity and regulated work area. Distinguish between trained full-time personnel and unskilled or temporary labor. Indicate whether or not any subcontracted labor will be utilized.

1.2.3.1.4 Provide anticipated number of shifts per day and days per week, as well as specific hours for each shift. Indicate any anticipated overtime, weekend work shifts, night shifts or holiday work shifts planned. Unless otherwise directed, plan to conduct all

abatement activities during swing shifts (M-F, 5:00 p.m. to 2 a.m. and 9:00 a.m.-5:00 p.m. Saturday and Sunday).

1.2.3.1.5 At a minimum, the Contractor's Progress Schedule is to be formulated on a three-week, "look ahead" basis and updated weekly.

1.2.3.1.6 All requests for deviations from, or changes to, the initially established daily work shift hours and/or the weekly work days shall be submitted in writing to the County and the Project IH Consultant for approval not less than 3 business days prior to the anticipated implementation of said changes. This requirement will also apply to remobilizations following periods of inactivity by the Contractor. The Contractor shall not implement any work schedule changes without the prior expressed approval of the County. The Contractor shall be responsible for its Subcontractors' compliance with these requirements.

1.2.3.2 Materials and equipment: Provide manufacturers' catalog data for all materials and equipment to be used in the work. Data should be provided for, but not necessarily be limited to, the following equipment/materials:

1.2.3.2.1 High Efficiency Particulate Air (HEPA) filtered vacuum equipment

1.2.3.2.2 Air monitoring equipment

1.2.3.2.3 Respirators

1.2.3.2.4 Personal protective clothing and equipment

1.2.3.2.5 Duct tape and sheet plastic

1.2.3.2.6 Disposal containers

1.2.3.2.7 MSDS sheets for all chemicals proposed for use on the job site

1.2.3.2.8 Rotameter and calibration curve

1.2.3.3 The Contractor will submit a project-specific lead compliance program to address the strategies for protecting workers from exposure to lead. The program will include all items required by 8 CCR §1532.1(e)(2) including the following:

1.2.3.3.1 Methods for demarcation and regulation of lead Work Areas

1.2.3.3.2 Plans for establishing support & decontamination areas

1.2.3.3.3 Air sampling plan

1.2.3.3.4 Medical surveillance plan

1.2.3.3.5 Engineering controls to be used

1.2.3.3.6 Personal protective equipment to be used

1.2.3.3.7 Decontamination procedures to be used

1.2.3.3.8 Methods of lead dust control to be used

1.2.3.3.9 Employee training requirements

1.2.3.3.10 Monitoring/exposure records

1.2.3.4 Notices:

1.2.3.4.1 Lead Pre-Job Notification: As applicable by the requirements of 8 CCR §1532.1(p), the Contractor will provide documentation of compliance by providing proof of written notification made to the nearest Cal/OSHA District Office.

1.2.3.4.2 Written proof that all required permits, licenses, and registrations have been applied for and/or received. This will include all Contractor and Project Superintendent Licenses and Certifications required under the federal, state, and local regulations.

1.2.3.4.3 The Work to be performed, as specified herein, is not intended to be "abatement," as defined in 17 CCR §35001.

1.2.3.5 Worker Documentation:

1.2.3.5.1 Provide the name and social security number of each employee to be engaged in lead-related construction work.

1.2.3.5.2 All workers must be trained in accordance with the requirements of Cal-OSHA's Construction Safety Orders for Lead [8 CCR §1532.1(*l*)]. This may include the need for CDPH-certified Lead Workers and/or Lead Supervisors. CDPH-certified Lead Worker and/or Lead Supervisor training must be conducted by a CDPH-approved Lead Worker/Lead Supervisor training provider. Provide current valid documentation from a CDPH-approved training provider indicating the most recent training course and training date that each person listed has attended. Photocopies of recent (within the 12 months preceding the anticipated Notice-to-Proceed date) training certification cards will suffice, as long as both sides of the card are provided and legible.

Provide the name and social security number of the Lead Supervisor responsible for this Project. Provide current valid documentation from a CDPH-approved indicating the most recent training course and training date that he/she has attended. Provide evidence indicating that he/she has a minimum of one year on-the-job experience as a Lead-Related Construction Supervisor.

All workers, machine operators, etc. involved in the handling, stockpiling, movement/transport of soil must provide current (within previous 12 months) valid documentation of worker training in accordance with Cal/OSHA Hazardous Waste

Operations and Emergency Response (8 CCR §5192, "HAZWOPER").

1.2.3.5.3 Provide current valid documentation indicating the date and type of each worker's most recent respiratory training and respirator fit testing. Respirator fit testing documentation must contain all information required in 8 CCR §5144 (m)(2). Documentation must be provided certifying that all employees engaged in lead-related work have passed respirator fit testing within the 12 months preceding the anticipated Notice-to-Proceed date.

1.2.3.5.4 The Contractor will submit documentation demonstrating that employees engaged in lead-related construction work have had the appropriate medical examinations within the prescribed time periods immediately preceding project start-up. Each such medical document must be signed by a licensed physician to be acceptable. Documentation must include, but not necessarily be limited to, baseline blood lead level testing performed in accordance with the Cal-OSHA Construction Safety Orders for Lead (8 CCR §1532.1, et. seq.), and the respiratory medical examination requirements in accordance with 8 CCR §1532.1. Baseline blood lead testing will have been completed not more than 30 days prior to the start of this Work. Illegible or incomplete photocopies, or preliminary results reports will be rejected as deficient.

1.2.3.5.5 The Contractor will submit a statement from an examining physician, dated within the 12 months preceding the start of this work, for each employee engaged in lead-related construction work stating that the worker is medically fit to wear a respirator, in accordance with 8 CCR §5144. Each such medical determination must be signed by a licensed physician to be acceptable. Illegible or incomplete photocopies, or preliminary examination reports will be rejected as deficient.

1.2.3.5.6 Completed Certificates of Lead Worker's Acknowledgment forms (Attachment A to this Specification section). The Contractor's employees will not be allowed to engage in lead-related construction work on this Project prior to submitting a completed Certificate of Lead Worker's Acknowledgment form.

1.2.3.6 Subcontractors: Submit qualifications and 24-hour contact information for each subcontractor to be used. This shall include two (2) legible copies of federal, state, and/or local business or operating permits, as well as State and/or EPA identification numbers for the waste transporters and disposal facilities to be used.

1.2.3.7 Work Plan: Submit a detailed work plan of the practices and procedures proposed for use in complying with the requirements of this Specification section. Include in the plan schematic drawings with depictions of the locations and general configurations of all regulated work areas. Mark-ups

of current project plans will suffice to satisfy this requirement. The text of the Work Plan should address the sequencing of the Work; the interface of trades involved in the performance of work; work schedule including work shift time, number of employees, date of start and completion including dates of preparation work, lead disturbance work, and anticipated completion/final inspection dates; methods to be used to assure the safety of building occupants and/or visitors to the site; disposal plan including name and location of accepted disposal facility(ies); and a detailed description of the methods to be employed to control worksite contamination. Expand upon the use of proposed engineering controls, methods of containment to control the potential creation of the lead hazards within the Work Area(s), and segregation and packaging of lead waste/debris. This Work Plan is not the same as the Lead Compliance Plan described in paragraph 1.2.3.3 above, although the two plans may be compiled in a single document, if all individually specified elements of the two plans are addressed. The plan must be reviewed and accepted by the County or Project IH Consultant prior to the commencement of work.

1.2.3.8 Contingency Plan: Submit a contingency plan for emergencies including medical, fire, accidents, injuries, power failure, or any event that may require modification of decontamination or Work Area isolation procedures. Include in plan specific procedures for decontamination and/or Work Area isolation. **Note**: Nothing in this specification should be interpreted as instructions to impede the rapid and safe exiting from the work area(s), nor to impede the provision of adequate medical attention in the event of an emergency.

> **Post**: In a room immediately adjacent to Personnel Decontamination Unit, prominently display telephone numbers and locations of, and driving instructions to, emergency services including, but not limited to: fire, ambulance, physician, hospital, police, power company, telephone company, and the Contractor's job-site Superintendent.

1.2.3.9 Field Logs: Submit a sample of Daily Field Logs, Work Area Entry/Exit Logs, etc. to be used during the work.

1.2.3.10 Rental Equipment: If rental equipment is to be used in conjunction with this lead-related construction project, a written notification is to be provided to the rental company informing the company that the rented equipment will be used on a lead-related construction project. A copy of that written notification will be submitted to the Project IH Consultant. The notification must state how the rented equipment is to be used, how it will be decontaminated following its use, and include a space for the acknowledgement of the rental company that it has been advised of the rented equipment's intended use. The Contractor will obtain written acknowledgment from an authorized representative of the rental company and will return an original signed copy of the acknowledgment to the Project IH Consultant as documentation of compliance with this requirement. In the

absence of such rentals, the Contractor will submit a signed declaration on the Contractor's letterhead and signed by an authorized representative of the Contractor stating that no rented equipment will be used by the Contractor on this project.

1.2.3.11 Material Safety Data Sheets: Submit current Material Safety Data Sheets for each potentially hazardous material to be used during the lead-related work.

1.2.3.12 Waste Hauling Qualifications: Submit proof of hazardous waste transporter's registration and the vehicle operator training. Submittals shall include, but not necessarily be limited to: business name, address (mailing address and physical location), and business telephone number of the company; primary contact name and emergency contact (24-hour) telephone number; documentation of current State and/or EPA authorization to operate; and insurance coverage.

1.2.3.13 Waste Disposal Facility Qualifications: Submit documentation of the California State and/or EPA-approved waste disposal facility chosen to receive shipments of lead-containing waste generated during this Project. Such information will include, but not necessarily be limited to: business name, address (mailing address and physical location), and business telephone number of the facility; primary contact name and emergency contact (24-hour) telephone number; documentation of current State and/or EPA authorization to operate; operator's facility I. D. number; classification and/or types of waste(s) accepted; name, business address and telephone number of insurance provider; documentation of insurance type(s), coverage amounts, and any limitations on liability; and any regulatory agency information pertaining to known citations issued, notices of violations issued, corrective actions ordered, Records of Decisions rendered, or on-going environmental investigations or known liabilities.

1.2.4 Post-Work Submittals:

1.2.4.1 General: In accordance with the requirements of the above Section 1.2.2.6.3 – Post-Work Submittals, submit the following documentation:

1.2.4.1.1 Copies of employee and visitor Work Area Entry/Exit Logs and Daily Field Logs/Reports.

1.2.4.1.2 Waste manifests, weight tickets, and landfill receipts.

1.2.4.1.3 Results of Contractor's personal exposure air monitoring.

1.2.4.1.4 Copies of analytical results from waste characterization.

1.2.4.1.5 Incident reports describing any events such as injuries, accidents, emergencies, or loss of differential air pressure and the actions taken in response.

1.3 QUALITY REQUIREMENTS

1.3.1 Reference Standards:

1.3.1.1 Regulations: The Contractor will comply with the requirements of all applicable federal, state and local government regulations and guidelines governing lead-related construction work and/or the disposal of lead-containing wastes, as well as all other applicable regulations. The following regulations and/or guidelines listed herein are applicable to this Work and are incorporated into this Specification section by reference. This listing is not intended to be comprehensive, nor does it necessarily limit compliance to the following:

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1926	Construction Standards
29 CFR 1926.62	Lead in Construction Standard
40 CFR Parts 50.12	Ambient Air Quality Standard for Lead
40 CFR Parts 261, 265, and 268	Hazardous Waste Management
40 CFR Parts 172, 173, 178 ,179	Hazardous Material Transportation 40
40 CFR Part 745	Lead Renovation, Repair, and Painting Final Rule

CALIFORNIA CODE OF REGULATIONS (CCR)

8 CCR §1532.1	Construction Safety Orders for Lead
8 CCR §1536	Construction Safety Orders – Ventilation Requirements for Welding, Brazing and Cutting
8 CCR §1537	Construction Safety Orders – Welding, Cutting, and Heating of Coated Metals
8 CCR §5144	Respiratory Protection
17 CCR Div. 1, Chapter 8	Accreditation, Certification, and Work Practices for Lead-Based Paint and Lead Hazards (revised 4/30/08)
22 CCR Division 4.5	Hazardous Waste

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Regulation 11, Rule 1	Hazardous Pollutants – Lead

1.3.1.2 Guidelines: Applicable industry guidelines pertaining to lead-related construction work include, but are not limited to, the following:

Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing, Office of Healthy Homes and Lead Hazard Control, U.S. Department of Housing and Urban Development (HUD), Second Edition July 2012.

Guide for Containing Surface Preparation Debris Generated During Paint Removal Operations, The Society for Protective Coatings (SSPC), Technology Guide No. 6, revised 2012.

1.3.1.3 Applicability. The most current version of each document will apply. Where conflicts among these regulations or standards exist, the more stringent requirement or interpretation will apply.

1.3.2 Definitions: In addition to definitions provided elsewhere in these Specifications, the following definitions will apply:

1.3.2.1 **Action Level:** Action level means an employee exposure, without regard to the use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air (30 $\mu g/m^3$) calculated as an 8-hour time-weighted average (TWA).

1.3.2.2 **Air Monitoring:** The process of measuring the contaminant concentration of a specific volume of air in a stated period of time.

1.3.2.3 **Authorized Visitor:** The County or its designated representative, the Project IH Consultant, the Project IH Consultant's inspector or representative, or any representative of a federal, state, county, city, or local agency having legal or regulatory jurisdiction over the project while acting in an official capacity. Any person whose name appears upon an approved authorized visitor's list.

1.3.2.4 **Clean Room:** An uncontaminated area or room which is part of the worker decontamination enclosure with provisions for storage of worker's street clothes and protective equipment.

1.3.2.5 **Containment:** A system, process, or barrier used to contain lead hazards inside a Work Area such as described in *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*, U.S. Department of Housing and Urban Development, June 1995, Chapter 8, "Containment and Barrier Systems," Table 8.1, Table 8.2, and Table 8.3, or "Guide for Containing Surface Preparation Debris Generated During Paint Removal Operations," Society for Protective Coatings, Technology Guide 6, October 1, 2004.

1.3.2.6 **Competent Person:** One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them, as specified in 8 CCR §1504.

1.3.2.7 **County:** The County of Alameda and its designated representative(s).

1.3.2.8 **Critical Barrier:** One or more layers of plastic or other impermeable barrier sealed over an opening into a Work Area or any other similarly placed physical barrier sufficient to prevent airborne lead dust in a Work Area from migrating to an adjacent area.

1.3.2.9 **Curtained Doorway:** A device to allow ingress and egress from one room to another while permitting minimal air movement between the rooms,

typically constructed by placing two overlapping sheets of plastic over an existing or temporarily framed doorway, securing the vertical edge of one sheet along one vertical side of the doorway, and securing the vertical edge of the other sheet along the opposite vertical side of the doorway.

1.3.2.10 **Decontamination Enclosure System:** A series of connected rooms, with curtained doorways between any two adjacent rooms, for the decontamination of workers and of materials and equipment. A decontamination enclosure system always contains at least one airlock.

1.3.2.11 **Differential Air Pressure Equipment:** A portable local exhaust fan or "unit" equipped with HEPA filtration and capable of maintaining a constant, negative air pressure differential within the regulated Work Area by providing a low velocity air flow into contaminated areas from adjacent uncontaminated areas and exhausting filtered air outside the Work Area (preferably to the outdoor air).

1.3.2.12 **DOP Testing:** The challenge testing of HEPA-filtered equipment, using appropriate aerosols. A 0.3 μm dioctylphthalate aerosol was formerly used in challenging the efficiency of HEPA-filtered equipment. Although dioctylphthalate compounds are now suspected human carcinogens, the phrase "DOP testing" is still current vernacular for the process of challenge testing the efficiency of HEPA-filtered equipment.

1.3.2.13 **Enclosure:** See "Containment"

1.3.2.14 **Equipment Decontamination Enclosure:** That portion of a decontamination enclosure system designed for controlled transfer of materials and equipment, typically consisting of a washroom and a holding area.

1.3.2.15 **Equipment Room:** A contaminated area or room which is part of the worker decontamination enclosure with provisions for storage of contaminated clothing and equipment.

1.3.2.16 **Fixed Object:** A unit of equipment or furniture in the Work Area which cannot be removed from the Work Area.

1.3.2.17 **HEPA Filter:** A High-Efficiency Particulate Air (HEPA) filter capable of trapping and retaining 99.97 percent of particles greater than 0.3 micrometers in mass median aerodynamic equivalent diameter.

1.3.2.18 **HEPA Vacuum Equipment:** Vacuuming equipment with a HEPA filter system.

1.3.2.19 **Lead:** Lead means metallic lead, all inorganic lead compounds, and organic lead soaps. Excluded from this definition are all other organic lead compounds.

1.3.2.20 **Lead-Related Construction Work:** Any construction, alteration, painting, demolition, salvage, renovation, repair, or maintenance of a public building,

including preparation or clean-up, that, by using or disturbing lead-containing material or soil, may result in significant exposure of adults or children to lead.

1.3.2.21 **Log Book:** A notebook or other book containing essential project data and daily project information and a daily project diary. This book will be kept up-to-date and on the project site at all times.

1.3.2.22 **Movable Object:** A unit of equipment or furniture in the Work Area which can be removed from the Work Area.

1.3.2.23 **MSDS:** Material Safety Data Sheet.

1.3.2.24 **Negative Initial Determination:** A demonstration by the employer, which complies with the criteria in paragraph (d)(5)(A) and (B) of 8 CCR §1532.1, that no employee is exposed to airborne concentrations of lead at or above the action level. The employer will make a written record of such a determination. The record will include at least the information specified in subsection (d)(3)(A) and will also include the date of determination, location within the worksite, and the name and social security number of each employee monitored.

1.3.2.25 **NIOSH:** National Institute of Occupational Safety and Health.

1.3.2.26 **Permissible Exposure Limit (PEL):** The Contractor will assure that no employee is exposed to lead at concentrations greater than fifty micrograms per cubic meter of air (50 $\mu g/m^3$) averaged over an 8-hour period. For work shifts longer than 8 hours, the maximum allowable employee lead exposure in units of micrograms per cubic meter of air will be calculated by the formula: 400 divided by the hours worked in that shift.

1.3.2.27 **Plasticize:** To cover floors, walls or ceilings with plastic sheeting as herein specified.

1.3.2.28 **Regulated Area:** An area established by an employer to demarcate areas within which lead-related construction work is conducted, and any adjoining area where debris or waste from such work may be accumulated; and a Work Area within which airborne concentrations of lead may exceed, or in which there is a reasonable expectation they may exceed, the permissible exposure limit. Requirements for regulated areas are set forth in 8 CCR §1532.1(i)(6).

1.3.2.29 **Time Weighted Average (TWA):** The TWA is an 8-hour time weighted average of the micrograms (μg) of lead per cubic meter (m^3) of air which represents the employee's 8-hour workday exposure. An 8-hour TWA is calculated in accordance with the formula:

$$\text{8-hour TWA} = \frac{(C_1T_1+C_2T_2+C_nT_n)}{480 \text{ minutes}}$$

where "C" is the contaminant concentration measured and "T" the measurement time period in units of minutes. If an employee is exposed to lead for more than 8 hours in any work day the employees' allowable exposure, as a time weighted average (TWA) for that day, will be reduced according to the following formula: Allowable employee exposure (in $\mu g/m^3$)=400 divided by hours worked in the day. When respirators are used to limit employee exposure as required under subsection (c) of 8 CCR §1532.1 and all the requirements of subsections (e)(1) and (f) have been met, employee exposure may be considered to be at the level provided by the protection factor of the respirator for those periods the respirator is worn. Those periods may be averaged with exposure levels during periods when respirators are not worn to determine the employee's daily TWA exposure.

1.3.2.30 **Washroom:** A room between the Work Area and the holding area in the equipment decontamination enclosure system. The washroom comprises an airlock.

1.3.2.31 **Work Area:** Designated rooms, spaces, or areas of the project in which lead-related construction will be conducted or which may become contaminated as a result of such lead-related construction. A contained Work Area is a Work Area which has been sealed, plasticized, and equipped with a decontamination enclosure system. A non-contained Work Area is an isolated or controlled-access Work Area which has not been plasticized nor equipped with a decontamination enclosure system.

1.3.2.32 **Worker Decontamination Enclosure System:** That portion of a decontamination enclosure system designed for controlled passage of workers, and other personnel and authorized visitors, typically consisting of a clean room, a shower room, and an equipment room separated by air locks.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Product Prohibitions: The following products or product constituents are prohibited from use during these lead-related work activities:

2.1.1.1 Any product for which a Material Safety Data Sheet is available from the manufacturer and has yet to be submitted.

2.1.1.2 Any product for which a less hazardous substitute product is readily available, provided that the substitute product possesses similar performance characteristics.

2.1.1.3 Any product containing any concentration of diethylene glycol dimethyl ether; ethylene glycol monoethyl ether; or ethylene glycol mono methyl ether (skin TLV 5 ppm; CAS 109-86-4). These constituents cause reproductive damage and blood cell damage.

2.1.1.4 Any product containing any concentration of ethylene glycol (1,2 Ethanediol glycol; TLV = 50 ppm). This chemical causes kidney damage if ingested.

2.1.1.5 Any product containing any concentration of formaldehyde, a suspect carcinogen.

2.1.1.6 Any product containing any concentration of methylene chloride, a suspect carcinogen.

2.1.1.7 Any product containing any concentration of n-hexane. This chemical causes peripheral nerve damage (potential ingredient in spray adhesive).

2.1.1.8 Any product containing any concentration of isocyanates. An allergic sensitizer, this group of chemicals typically has no warning properties (potential ingredient in spray foams and some epoxies).

2.1.1.9 Non-fire rated visquene and/or non-fire rated lumber are prohibited from use.

2.1.1.10 Solvents with a flash point $<140^{o}$ F are prohibited from use.

2.1.2 EQUIPMENT PROHIBITIONS: The following equipment are prohibited from use during these lead-related construction activities:

2.1.2.1 Fasteners: High velocity powder-actuated fasteners are prohibited from use.

2.1.2.2 Torches: Open flame torches are prohibited from use without prior approval of the County. Open flame torches are prohibited from use as a means of removing lead-containing materials, paints or surface coatings on this Project.

2.1.2.3 Compressed Air: Air compressors, leaf blowers or similar forced-air equipment is prohibited from use for cleaning or decontamination purposes during these lead-related work activities.

2.1.2.4 Lamps: Sodium or mercury vapor (metal halide) lamps are prohibited from use.

2.1.2.5 Ladders: Wooden or metal ladders are prohibited from use.

2.1.2.6 Engines: Internal combustion engines shall not be permitted for operation indoors without the expressed written permission of the County in consultation with the Project IH Consultant.

2.1.2.7 Grounded Electrical Equipment: Electrical equipment manufactured with internal grounding or grounded wiring shall not be used if the grounding has been removed, tampered with, or otherwise altered.

2.1.2.8 HEPA-Filtered Vacuum Cleaners Without Certification of Efficiency Challenge Testing: Vacuums without certification of on-site testing for efficiency ("DOP testing") shall not be allowed for use outside of a negative differential pressure enclosure ("containment").

2.1.2.9 Power tools, including but not limited to sanders, grinders or needle guns, that are not equipped with HEPA-filtered dust capture systems, are

prohibited from use as a means of removing lead-containing materials, paints or surface coatings on this project.

2.1.2.10 Hydro blasting or high pressure washing ("power–washing") and/or abrasive media blasting without containment and barrier systems is prohibited on this Project.

2.1.3 Material Requirements:

2.1.3.1 Sealants: Sealants used will have a flame spread, smoke and fuel contribution of zero, and will be ASTM and UL rated for 3 hours for standard method fire test for fire stop systems

2.1.3.2 Visquene Sheeting: Visquene sheeting used will be in compliance with NFPA Standard 701 fire testing, with flame spread $\leq$ 5 and smoke development rating of $\leq$ 70 when tested by ASTM E-84. Minimal thickness will be 6 mil.

2.1.3.3 Waste Containers: Waste containers (bags, drums, bins, etc.) must be suitable for loading, temporary storage, transit, and unloading of lead waste without rupture, or otherwise causing exposure to persons or releases to the atmosphere. Use of rigid primary containers (bins, boxes, drums, etc.) is preferred and recommended. Where rigid primary containers are used, they must be lined with a secondary water-proof barrier of poly sheeting or poly bags of minimal thickness of 6 mil. All containers used for disposal of lead-containing waste must be labeled in general accordance with applicable regulations, and in specific with the requirements of 8 CCR §1532.1.

2.1.3.4 Adhesives: Adhesives, whether tape or aerosol liquid, shall be capable of securely bonding plastic to plastic, or plastic to substrate. The bonding strength and resulting seal of the material used must not be compromised by mist or water, encapsulating agent or any other product or process used in the regulated work area.

2.1.3.5 Warning Signs and Labels: Warning signs and labels will be used in compliance with applicable federal, state, and local regulations. Signs must be lettered in the language(s) necessary to communicate the specific hazard warning(s) to workers or visitors reasonably expected to be at the job site.

2.1.4 Equipment Requirements:

2.1.4.1 General: It is the responsibility of the Contractor to utilize tools and equipment that have been thoroughly and adequately decontaminated prior to their delivery to this project site. All equipment brought onto this project work site will be subject to inspection by the County and/or the Project IH Consultant. Visible evidence of suspected equipment contamination will be sufficient to cause the equipment to be rejected from mobilization onto the project work site. All costs resulting from the need to decontaminate any part of the worksite contaminated by the Contractor's use of inadequately decontaminated equipment will be borne by the Contractor.

2.1.4.2 Differential Air Pressure Equipment: Differential air pressure equipment (also known as "exhaust fan units" or "negative air machines") shall be

equipped with HEPA filtration. All differential air pressure equipment will be in well-maintained condition and will comply with ANSI/AIHA Standard Z9.2 for performance. Differential air pressure equipment will arrive on-site with the intake and exhaust openings sealed. Each unit must be efficiency-challenged ("DOP tested") on-site, in the presence of the Project IH Consultant and prior to use, so as to ensure a minimum 99.97% filtering efficiency of aerosol particulates of 0.3 microns or greater in size. DOP testing shall be performed by a professional third-party testing firm not otherwise financially affiliated with the Contractor. Each unit used on this project must have a certification label affixed to it attesting to its most recent successful testing. Upon arriving on-site, each unit must be visibly clean and free of apparent or suspected contamination, as judged by the Project IH Consultant. If, in the opinion of the Project IH Consultant, the differential air pressure units are judged to be in need of cleaning, maintenance, or in any other way fail to meet typical industry standards, the unit(s) may not be placed into operation on this project. If secured, negative air machines may be stacked, but no more than two high without the prior approval of the Project IH Consultant, and in no event will negative air machines be allowed to be inverted for the purpose of stacking.

2.1.4.3 HEPA-filtered Vacuum Cleaners: HEPA-filtered vacuum cleaners will be in well-maintained condition, and must be visibly clean and free of apparent or suspected contamination, as judged by the Project IH Consultant. **Each unit must arrive on-site sealed and empty of any debris.** Each unit must be DOP tested on-site, within a negative pressure enclosure, before it can be used outside of a regulated work area. DOP testing will be performed by a professional third-party firm not otherwise financially affiliated with the Contractor. Each unit used on this project must have a certification label affixed to it attesting to its most recent successful testing. If, in the opinion of the Project IH Consultant, the HEPA-filtered vacuum cleaners are judged to be in need of cleaning, maintenance, or in any other way fail to meet typical industry standards, the vacuum cleaners may not be placed into operation on this project. Care will be exercised by the Contractor to prevent commingling of asbestos and lead waste. Separate vacuums will be used for each type of waste clean-up.

2.1.4.4 Lights and Electrical Cords: Electrical lights and equipment utilizing electrical power cords will be in well-maintained condition and will be visibly clean and free of apparent contamination, as judged by the Project IH Consultant. All lighting and electrical equipment must be water resistant. Work lighting must have protective covers over the light source. Grounded electrical equipment will be used with grounded electrical supply and outlets. Where such equipment will be used in the near vicinity of water, ground fault circuit interruption (GFCI) protection shall be used in the wiring circuit at the first feasible point closest to the source of power.

2.1.4.5 Decontamination Facilities: At a minimum, hand washing facilities will be provided by the Contractor for all workers who may be occupationally exposed to lead-containing paint or by demolition of lead-containing materials, irrespective of measured airborne lead concentrations. More extensive decontamination facilities may be required by regulation.

2.1.4.6 Water Filtration Equipment: Water will be collected from work processes and decontamination facilities and will be filtered prior to discharge. All lead-contaminated water will be collected and contained for waste characterization. Water will be filtered through a system capable of trapping particles 1 micron and larger in size. Filtered water may be discharged into a sanitary sewer system, only if the Contractor can satisfactorily demonstrate that it is acceptable to the local wastewater treatment facility to do so. The Contractor shall bear the responsibility to investigate discharge requirements and to obtain any necessary discharge permits prior to the start of work. To the extent feasible, water should be reclaimed and used on-site for application in wet method work practices prior to its discharge. Under no circumstances will water be permitted to be discharged prior to its characterization as a potential hazardous waste.

2.1.4.7 Fire Extinguishers: Fire extinguishers, rated not less than 2A or as specified by more stringent regulations, will be required in the regulated work area(s). The minimum allowable number of fire extinguishers in any individual work area will be one in the regulated work area and one in the clean area.

PART 3 - EXECUTION

3.1 PREPARATION

3.1.1 Examination of Conditions: The Contractor must carefully examine the work site before beginning work and report any previously undisclosed or special conditions to the County. Except as may be otherwise stipulated elsewhere in the Contract Documents, starting the Work shall be interpreted as implied acceptance of conditions as they exist.

3.1.2 Responsibility for Work: By commencing the Work, the Contractor acknowledges and agrees that he has sole and primary responsibility and obligation to the County to make inspections of his own work at all stages of the Work. This includes acknowledging and agreeing that he has sole responsibility to supervise or superintend the performance of the Work, and that said work will be in strict adherence and compliance with all applicable methods, materials, regulations, and required standards whether or not specified herein. The Contractor is responsible for site security upon starting the project. This responsibility extends 24 hours per day until project completion and final demobilization.

3.1.3 Coordination of Work: The Contractor is responsible to coordinate all scheduling, phasing, and completion of lead-related construction work with the County and all other employers working on the job site during the abatement activities. This includes the responsibility to make notifications or communications of hazards to other trades or employers, as required by regulation.

3.1.4 Measurements and Quantities: The Contractor is responsible to field verify all measurements, dimensions and/or quantities before the start of work. Discrepancies between plan and field dimensions or quantities shall be reported to the County as soon as discovered.

3.1.5 Job Site Postings: Prior to commencing any preparation of the Work Area(s) for lead-related construction activities, the Contractor will post all required documents, warning

signs, and erect any physical barriers in order that the work area(s) may be secured. Prior to the commencement of any work, the Contractor will post bilingual or multi-lingual (as appropriate) warning signage in and around the work site in compliance with applicable regulations.

3.1.6 Pre-Work Conference: Prior to the start of any work, the Contractor shall meet at the project site with the Project IH Consultant, the County, and other entities concerned with the lead-related work. This will be an organizational meeting to review responsibilities and personnel assignments; to identify any special needs or conditions pertaining to the work or its completion; to identify the work area containment and decontamination areas; and to coordinate temporary facilities including power, light, water, waste storage, etc.

3.1.7 Work Area Preparation:

3.1.7.1 Containment of Work Areas: Work Areas wherein lead-related construction work will occur must, at a minimum, be prepared in general accordance with containment methods set forth in Chapter 8 of the HUD Guidelines, or alternatively, in accordance with The Society for Protective Coatings (SSPC), Technology Guide No. 6, 2012.

3.1.7.2 Work Area Designation: Each regulated work area will be designated by the Contractor and discussed with the Project IH Consultant prior to its preparation. At a minimum, topics will include ingress and egress points, work area configurations, containment methods, and installation of decontamination facilities. This may be accomplished at the Pre-Work Conference.

3.1.7.3 Electrical Lock-out: The Contractor, in coordination with the County, is responsible for the shutdown and disconnection of all electrical power within the work area. The Contractor will arrange for temporary power and lighting, and will ensure safe installation of temporary power sources and equipment per applicable electrical code requirements. The Contractor should notify the County in writing before disconnecting any power or communication lines that may service the subject buildings or adjacent buildings.

3.1.7.4 Work Area Preparation: Polyethylene (poly) sheeting will be used to capture and contain lead debris contamination during routine removal from a substrate. Poly sheeting can be used in combination with water misting (dust suppression) to protect the adjacent surfaces (including any exposed exterior soils surrounding building exteriors that may be impacted by the Work) during disturbance of exterior surfaces. Adequate protection of non-impacted building areas, and/or exterior soils or pavements, may require the use of multiple layers of poly sheeting, or alternatively effective means. Where poly sheeting is used, the sheeting layers will be firmly affixed to, and extend outward a minimum of 6 feet from interior building walls and 20 feet for exterior foundations. If, during the disturbance of paint or building components, it is evident that lead-containing paint/debris are falling or will likely fall beyond the poly sheeting, the distance will be increased and/or modified as necessary to capture all debris. Doors, windows and other lead-

painted or lead-containing materials subject to disturbance will be similarly prepared with poly sheeting and adhesive tape, or alternatively effective means, so as to contain lead-containing dust or debris to within the regulated Work Area. Damage to, or holes created in, poly sheeting barriers during the Work will be immediately repaired.

3.1.7.5 Effect of Wind on Exterior Work: The Contractor will take all necessary steps to protect exterior soils, adjacent buildings and properties, and storm drains from impact by lead debris. Work Area preparation will include wind breaks or baffles, as necessary, to prevent lead dust or debris from being wind blown out of a regulated Work Area. The Contractor will halt the Work if Work Area preparations are demonstrably inadequate to contain debris within the regulated area(s). In no case will exterior lead paint disturbance be conducted during inclement weather, nor when wind speeds reach a sustained velocity of, or repeated peak gusts of, 20 miles per hour.

3.1.7.6 Decontamination Facilities: Prior to the start of work, at a minimum, a hand washing facility must be provided by the Contractor for all workers who may be occupationally exposed to lead-containing paint or by demolition of lead-containing materials, irrespective of measured airborne lead concentrations. A fully functioning shower facility will be provided if work activities result in, or should reasonably be expected to result in, personal exposures to lead in excess of the PEL.

3.1.7.7 Movable and Loose Items: Movable and loose items located within the work area(s) and not removed by the County are to be cleaned using HEPA-filtered vacuum equipment and/or wet cleaning methods, as appropriate, and will be removed from the work area to a temporary location designated by the County. The items will be received by and protected from future damage or loss by the County.

3.1.7.8 Regulation of Work Areas: Prior to lead-related construction work, the Contractor will regulate the Work Area(s) by methods including, but not necessarily limited to: posting lead-warning signs at all entrances to the Work Area(s). These signs will be in compliance with the Cal-OSHA Construction Safety Orders for Lead (8 CCR §1532.1 et. seq.). Only authorized workers and visitors will be allowed into a regulated Work Area.

3.1.7.9 Adjacent Areas: Work areas immediately adjacent to the Work, such as corridors or hallways which will not be subject to the Work, but are necessary routes to and from Work Areas, must be protected by the Contractor to prevent damage and/or lead contamination. Openings from these areas into areas where lead-containing material is being disturbed will have curtained doorways to further minimize airborne lead release into non-regulated areas. The Contractor will be responsible to make all required notifications to trades or other building occupants working in areas adjacent to regulated Work Areas.

3.1.7.10 Emergency Exits: The Contractor will establish and maintain emergency and fire exits from the Work Areas, or establish alternative exits, as may be required by local fire officials or applicable fire codes.

3.1.7.11 Pre-Work Inspections: Prior to the start of lead-related work, the Contractor's Supervisor (Competent Person), accompanied by the Project IH Consultant, will conduct an inspection of the equipment and Work Area isolation preparations to assure that appropriate engineering controls are in place and are functioning sufficiently to contain lead hazards to within the Work Area. The concurrence of the Project IH Consultant will be required to determine that a Work Area has undergone adequate preparation to proceed with lead-related work. This Pre-Work Inspection will be conducted for each regulated Work Area and each individual inspection will be documented in writing. Such documentation will be signed by the individuals conducting the inspection. A copy of each such documentation shall be obtained by the Project IH Consultant for conveyance to the County.

3.2 METHOD OF CONTROL

3.2.1 Work Practices:

3.2.1.1 General: At all times, the Contractor will employ Lead Safe Work Practices to minimize or eliminate the potential for creating personal exposure to lead or creating lead hazards. This will include, but not necessarily be limited to, pre-cleaning the Work Area; misting the air within the Work Area, as necessary to reduce airborne lead dust concentrations; use of wet work methods (e.g., wet sanding and/or wet scraping) to reduce dust generation; prompt clean-up of lead-containing waste or debris; use of power tools equipped with HEPA-filtered dust collection systems; use of HEPA-filtered vacuums, when vacuums are used; use of HEPA-filtered exhaust fans, where deemed necessary to create a negative air pressure differential within the Work Area (see Chapter 8 of the HUD Guidelines); removal of lead-containing coatings from metal substrates prior to torch cutting; and employing the engineering controls necessary to reduce airborne lead dust concentrations within a Work Area.

3.2.1.2 Work Crew Size: The Contractor is responsible for setting the size of its work crew(s), subject to the conditions stated in this paragraph. During lead-related construction work, a minimum of two (2) workers must be in the Work Area at any time. No worker shall be allowed to work alone in a regulated Work Area. Under no circumstances may workers be allowed to work without the supervision of an on-site foreman while within the Work Area. The crew size on any given day will be adequate to progress and/or complete the Work in accordance with the established Project Schedule.

3.2.1.3 Worker Discipline: The Contractor will at all times establish and maintain discipline and good order over its employees. The Contractor will not employ on the work crew any person not skilled in the Work to which he/she is assigned, nor anyone who has not received notice and instructions in the dangers of lead exposure, and in the methods of reduction of the dangers associated with its disturbance. Workers must also receive training in the proper use of respirators, safety procedures, equipment, protective clothing, and appropriate work procedures. The Contractor will remove from the job site any employee repeatedly failing to adhere to any standard or requirement set forth herein.

3.2.1.4 Visible Emissions: The Contractor is solely responsible for conducting on-going visual observations of the Work Area(s). If, at any time, visible emissions appear to be emanating from the Work Area, the Contractor will immediately cease work and establish more stringent engineering controls, or otherwise revise its work practices, to eliminate the visible emissions.

3.2.1.5 Demolition of Components: All work which disturbs deteriorated ("loose, flaking or peeling") lead-containing paint or lead-containing materials will be done utilizing hand tools. Loose, flaking or peeling paint will be removed with hand tools prior to demolition of building components. Power tools may be used for such work only if the power tools are equipped with HEPA-filtered dust collection systems. Surface preparation prior to demolition will likewise be done by hand with wet methods. Water may be used in sanding or scraping ("wet work methods") only in quantities sufficient to minimize airborne dust, but may not be used in such a volume as to cause run-off. All lead-contaminated water will be collected and contained for filtration and/or waste characterization. For this reason, power-washing should be avoided.

3.2.1.6 Removal of Toxic Coatings: In accordance with 8 CCR §1537, et. seq., all surfaces covered with toxic preservatives, including coatings which generate toxic substances upon heating, will be stripped for a minimum distance of four inches from the area of heat application, or the employee(s) engaged in such work will be required to use supplied-air respirators in accordance with 8 CCR §5144, et. seq., or the provisions of 8 CCR §1536(b), (c) will apply.

3.2.1.7 Indoor Torch Cutting: Where indoor torch cutting will be conducted which involves building components coated with hazardous materials including, but not necessarily limited to lead, the work will be conducted in accordance with 8 CCR §1536, et. seq. Materials or surfaces from which lead-containing paints or coatings have been removed are not to be considered "lead-free," and are still subject to this requirement until and unless a Negative Exposure Assessment has been established in accordance with 8 CCR §1532.1(d)(5).

3.2.1.8 Material Handling: Where lead-painted or other lead-containing building components are to be removed, the Contractor will, to the extent possible, remove them substantially intact and, where elevated, lower them to the ground for containerization. At no time may materials be allowed to drop to, nor accumulate upon, unprotected soil surfaces. Any loose or peeling paint will be removed before a painted building component is removed from the building and before the building is demolished. Painted building components with intact coatings (no loose or peeling paint) can be demolished with the paint in place. All lead-containing particulate debris must be collected and placed in leak-proof containers and stored for waste characterization.

3.2.1.9 Work Area Cleaning: Clean-up and containerization of lead-containing waste will be an on-going activity throughout the Work. Lead-containing debris must not be allowed to accumulate within the Work Area for subsequent clean-up. Containerized waste may be stored within the Work Area during the Work, but should be removed from the Work Area for

storage in a secured location on a periodic basis. In no event will the accumulation of containerized waste within the Work Area be allowed to impede the work progress, nor compromise work-site safety.

3.2.1.10 Containerization of Waste: Unless otherwise specified, lead-containing debris and waste will be containerized in rigid primary waste containers (boxes, drums, bins, etc.) suitable for loading, temporary storage, transit, and unloading of lead waste without rupture, or otherwise causing exposure to persons or releases to the atmosphere. Rigid primary containers will be lined with a leak-proof barrier of poly sheeting or poly bags of minimum thickness of 6 mil. Waste containerized in bags will be double-bagged, evacuated of air, and sealed with duct tape. All containers used for disposal of lead-containing waste will be labeled in general accordance with applicable regulations.

3.2.1.11 Waste Load Out: Prior to the removal of containerized waste from the Work Area, each container will be decontaminated by wet-wiping to remove any residual lead contamination. Double-bagging of waste will be completed within the regulated Work Area and the exterior of each container will be individually wet-wiped prior to removal from the Work Area. Waste shall be loaded out of the Work Area through the equipment decontamination (waste load out) chamber and not through the personal decon. Once outside of the Work Area, the waste will be transported in rigid movable bins, wheelbarrows or comparable directly to a secured waste storage location.

3.2.1.12 Equipment Decontamination: Prior to removal from a Work Area, the Contractor will decontaminate all tools and equipment. Decontamination will include, but not be limited to: wet-wiping, HEPA-vacuuming, and containerizing tools into subsequently decontaminated containers. Prior to removal from the Work Area, HEPA-filtered vacuum cleaners will be emptied of debris, wet-wiped and wrapped, bagged or otherwise containerized for transport from the Work Area. Likewise, differential air pressure equipment is to be sealed with poly sheeting and tape, and externally decontaminated before removal from the Work Area. All equipment will be subject to inspection by the Project IH Consultant prior to its demobilization from a regulated work area.

3.2.1.13 Detail Cleaning: Following completion of the Work, the Work Area will be cleaned using a combination of hand tools (mops, rags, etc.), wet-wiping, and HEPA vacuuming. Dry sweeping or shoveling of lead-containing waste or debris is prohibited. Any poly sheeting protecting the Work Area will be considered to be adequately cleaned when no visible and no three-dimensional remnant of debris or lead-containing waste can be seen or felt. Porous substrates such as wooden or concrete will similarly be considered to be adequately cleaned when no three-dimensional remnant of debris or lead-containing waste can be seen or felt. In no event will bridging encapsulants be allowed in lieu of detail cleaning.

3.2.1.14 Post-Work Inspections: Subsequent to the completion of the cleaning phases and waste load-out, the Contractor's Supervisor (Competent Person), accompanied by the Project IH Consultant, will conduct a detailed inspection

of the Work Area to assure that the Work Area has been adequately cleaned. The concurrence of the Project IH Consultant will be required to conclude that a Work Area has undergone adequate cleaning following lead-related construction work. If a Work Area is not visibly free of all debris, the Contractor will re-clean the Work Area using wet-wiping and HEPA vacuums until a satisfactory condition is established. This Post-Work Inspection will be conducted for each regulated Work Area and each individual inspection will be documented in writing. Such documentation will be signed by the individuals conducting the inspection. A copy of each such documentation will be obtained by the Project IH Consultant for conveyance to the County. All non-essential equipment is to be decontaminated, as described herein, and removed from the Work Area prior to commencing a Post-Work Inspection.

3.2.1.15 Poly Removal: At the end of the work within a regulated Work Area, the poly sheeting will be cleaned, the Post-Work Inspection will be conducted and the poly sheeting will be removed. The poly sheeting must be thoroughly cleaned and decontaminated to allow it to be disposed of as "non-hazardous" waste. Cleaning will include wet wiping and vacuuming with a HEPA-filtered vacuum, as necessary. Following the successful completion of the Post-Work Inspection in each Work Area, the Contractor may remove the final layer(s) of plastic from the walls, floors, and/or ceilings (as applicable). All other isolation engineering controls including decontamination facilities will likewise remain in place until the successful completion of the Post-Work Inspection is achieved. No alternative approaches may be implemented without the concurrence of the Project IH Consultant. The Contractor will containerize removed plastic and any remaining debris, decontaminate the container, and dispose of the container and its contents as lead-contaminated waste. All other isolation engineering controls including decontamination facilities may similarly be removed once all specified clearance criteria have been met. **Removal of plastic layers and isolation engineering controls ("teardown") may not occur without the knowledge and consent of the Project IH Consultant.** The Contractor will conduct a post-teardown visual inspection of the work area to identify and remove any debris that may have resulted from containment breaches or from containment removal.

3.2.2 Worker Protection And Personal Decontamination

3.2.2.1 General: The Contractor will be solely responsible for the safety, efficiency, and adequacy of its work, workers, equipment and methods, and for any damages which may result from their negligent actions, practices, construction, maintenance, or operations. The Contractor will erect and maintain at all times, as required by the condition and progress of the Work, proper safeguards for the protection of the workers and the public, including the posting of appropriate and applicable warning signage on the site.

3.2.2.2 Competent Person: The Contractor will designate a responsible member of its organization to be present on the work site, whose duty shall be the detection, recognition, and prevention of accidents and potential accidents. The designated individual will assume and fulfill the duties of the

Competent Person, as defined in 8 CCR §1504. In the absence of notice to the contrary, provided in writing to the Project IH Consultant, this person will be the on-site Lead-Related Construction Supervisor of the Contractor.

3.2.2.3 Toxic Exposure Responsibility: To the extent allowable by law, the Contractor assumes all responsibility for any toxic exposures or effects experienced by workers as a result of the air quality supplied to respirators. The Contractor will assume all responsibility for any toxic exposures or effects to all personnel or property caused by airborne particulates, mists, vapors, or any wetting agent(s), or hazardous substances, and for the legal disposal of said substances and/or any residual toxic residues. Commencement of the Work by the Contractor will constitute implied acceptance of these responsibilities.

3.2.2.4 Separation of Facilities: Workers engaged in lead-related construction or lead-disturbing activities will not be permitted to eat, drink, smoke, chew gum, apply cosmetics, or use tobacco products within a regulated Work Area. Lavatory facilities, eating facilities and clothing change areas are to be established and maintained separate from the regulated Work Areas.

3.2.2.5 Environmental Quality: At the discretion of the County, on-site environmental sampling for airborne or surface wipe concentrations of lead may be conducted at any time, in any location, with or without prior notice. The purpose of this environmental sampling will be to evaluate whether existing containment or engineering controls are adequate and sufficient to prevent the release of lead outside of regulated Work Areas. Such sampling, if conducted, would not be intended to meet the definition of a "lead hazard evaluation", as defined in 17 CCR §35038(a).

3.2.2.6 Respiratory Protection: Prior to commencement of work, all workers engaged in lead-related construction or lead-disturbing activities will be instructed in, and will be knowledgeable of, the use of respiratory protective equipment. Respiratory protection will be utilized only after all other feasible lead exposure hazard reduction methods have been implemented and demonstrated to be insufficient to reduce worker exposures to below the Action Level. All respiratory protection measures will be provided to workers in conjunction with a respiratory protection program which will meet the requirements of Cal-OSHA regulations set forth in 8 CCR §5144 and 8 CCR §1532.1(f). This includes qualitative or quantitative fit testing. The following additional requirements will apply:

3.2.2.6.1 The Contractor will provide its workers with respiratory equipment approved by the National Institute for Occupational Safety and Health (NIOSH) for use in atmospheres containing lead dusts. Respiratory protection will be issued to workers for their sole and individual use. Respiratory protection will be worn by all on-site personnel entering the regulated Work Area(s). Respiratory protection will be worn at all times when inside the regulated Work Area, as well as during personal decontamination.

3.2.2.6.2 Where respirators with disposable filters are employed, the Contractor will provide sufficient filters for replacement as necessary by the worker, or as required by the applicable regulation.

3.2.2.6.3 In the absence of exposure monitoring data conforming to all Cal-OSHA requirements, the Contractor will assume lead exposures within work areas exceed the PEL and will, at a minimum, utilize the respiratory protection required for Low Exposure Trigger Tasks (i.e. manual demolition). In such instances, half-face mask, negative pressure, air-purifying respirators fitted with P-100 filter cartridges may be utilized during the disturbance of lead-containing materials. If half-face mask, negative pressure, air-purifying respirators are utilized, the workers will also be required to wear approved safety glasses or goggles. Workers engaged in Medium Exposure Trigger Tasks or High Exposure Trigger Tasks will, at a minimum, utilize the respiratory protection prescribed for those exposures and Trigger Tasks.

3.2.2.6.4 The Contractor will supply its workers with adequate respiratory protection, to meet the minimum standards of the applicable Cal-OSHA requirements. In accordance with 8 CCR §1532.1, the Contractor will have a Competent Person conduct exposure assessments and periodic monitoring to establish the minimum appropriate respiratory protection to be used and the effectiveness of the chosen respiratory protection. Until the Contractor performs exposure assessments in compliance with 8 CCR §1532.1(d) which determine actual employee exposures, the Contractor is to assume that workers conducting Low Exposure Trigger Tasks (i.e. manual demolition) are being exposed to airborne lead in excess of the PEL, but not in excess of 10 times the PEL, and will protect employees accordingly. In addition, the Contractor will require and enforce the use of the following activity-related requirements:

(a) Work involving the use of solvents or volatile organic compounds will be conducted with the use of air purifying respirators equipped with HEPA and Organic Vapor cartridges.

(b) Any question as to respiratory protection requirements for any activity unnamed or not otherwise described herein, by default, will require the maximum respiratory protection required by regulation.

(c) Appropriate respiratory equipment will be required of all persons entering into regulated Work Areas.

3.2.2.6.5 The Contractor will post in the Equipment Room and the Clean Room, all decontamination and safety procedures to be followed for ingress and egress from Work Areas.

3.2.2.7 Protective Clothing: The Contractor will provide workers with sufficient sets of hooded, disposable, full-body coveralls recommended for use in lead-related work operations equivalent to DuPont "TYVEK-Type 14". Such full body protective clothing will include, but not be limited to:

3.2.2.7.1 Foot coverings including safety shoes or boots.

3.2.2.7.2 Protective head coverings (hard-hats).

3.2.2.7.3 Protective clothing should be hooded, full-body coverall type.

3.2.2.7.4 Durable water-proof gloves (plastic, latex, rubber, nitrile, etc.) selected for chemical compatibility of the glove material and the liquid materials to be handled. Cloth or leather gloves may also be worn for comfort, but shall not be worn alone when handling hazardous liquids.

3.2.2.8 Additional Clothing Requirements: The Contractor will observe the following additional work clothing requirements:

3.2.2.8.1 Any non-decontaminated protective clothing will remain within the contaminated areas, and will be disposed of as lead-contaminated waste upon completion.

3.2.2.8.2 Provide authorized visitors with disposable sets of protective full-body clothing, as needed to enter into regulated Work Areas.

3.2.2.8.3 Provide eye protection and hard hats as required for job conditions or by applicable safety regulations. Where negative pressure respirators are worn, they will be full-faced, unless the Contractor also provides protective eye wear.

3.2.2.8.4 All clothing will be sealable by design or by securing with tape at the workers' ankles and wrists.

3.2.2.9 Personal Exposure Monitoring: It will be the Contractor's responsibility to conduct required personal exposure monitoring. Such exposure monitoring will be in full compliance with the requirements of 8 CCR §1532.1 and 8 CCR §5144. The Contractor will monitor the airborne lead exposures of not less than 10% of the work crew, or a minimum of two (2) workers, whichever is greater. Workers will be monitored in "worst case scenario" tasks, as well as those conducting less hazardous work. Personal exposure monitoring is not the responsibility of the County, nor of the Project IH Consultant, however, the Project IH Consultant may elect to conduct such monitoring as a supplemental or quality assurance measure. Personal exposure monitoring conducted by the Project IH Consultant is not to be construed as a substitute for, nor in any way to obviate, the Contractor's duty to conduct such monitoring. Analytical results of Contractor's personal exposure monitoring will be posted daily at the work site, and copies of the analyses are to be submitted to the County along with the Post-Job Submittals.

3.2.3 Waste Management And Disposal

3.2.3.1 General: The Contractor will be responsible for the safe handling, packaging, labeling, storage and transportation of all lead-containing waste (hazardous and non-hazardous) generated by the Work. By commencing this work, the Contractor implicitly agrees to bear all costs arising from any claims, damages, losses, and/or clean-up expenses incurred which, as a result of the Contractor's negligence, result from a lead release(s) on the job-site or while lead waste is in transport to a waste disposal facility. The Contractor or its designated subcontract waste hauler will deliver all lead-containing waste materials to an appropriately designated waste disposal facility that has been accepted by the County and which is permitted in accordance with applicable regulations.

3.2.3.2 Waste Segregation: All removed lead-containing paint, ceramic tile glaze debris, rags, respirator cartridges, disposable suits and any other lead-containing wastes generated during lead-related construction work will be considered potential hazardous waste until characterization has been performed in accordance with 22 CCR §66261.24. Waste will be segregated into distinct waste streams according to the waste categories suggested in the HUD Guidelines, which include:

3.2.3.2.1 Category I: Low Lead Waste – typically consists of non-hazardous construction materials, filtered wash water, cleaned plastic sheeting, and other items that test as non-hazardous;

3.2.3.2.2 Category II: Architectural components such as painted finished items like doors, windows, trim, etc. which demonstrate intact, undeteriorated and/or stabilized surface coatings;

3.2.3.2.3 Category III: Concentrated Lead Waste - typically hazardous materials such as paint sludge, paint chips vacuum debris, vacuum filters, and any waste testing hazardous; and

3.2.3.2.4 Category IV: Other waste requiring characterization testing.

3.2.3.2.5 Any asbestos-containing or asbestos-contaminated waste generated during the work will be segregated from suspected lead waste. Care will be exercised by the Contractor to prevent, where feasible, commingling of asbestos and lead waste. In general, separate vacuums will be used for each type of waste clean-up.

3.2.3.3 Storage Facilities: The Contractor will assure that all lead-containing waste (hazardous and non-hazardous) generated by the Work is stored in a secured manner until received at the waste disposal facility. Debris bins, storage enclosures, etc. will be locked overnight and whenever the Contractor is off-site or unable to directly monitor their contents and management. The Contractor will ensure that the appropriate and required warning signs are posted on waste storage locations. The Contractor will be responsible to maintain the waste storage facilities in an orderly and well-kept condition at all times. The Contractor will conduct routine waste storage area inspections to assure that appropriate storage conditions are maintained. Waste is not to be co-mingled with stored non-waste material or equipment.

All waste will remain stored in secured waste storage areas until results of waste characterization are available. Due to analytical methods required for waste characterization, this may require storage for up to 10 working days or more.

3.2.3.4 Waste Characterization for lead hazard content will be performed as stipulated in Title 22 of the California Code of Regulations, including using one or more of the following testing procedures, as required:

3.2.3.4.1 Total Threshold Limit Concentration (TTLC);

3.2.3.4.2 Waste Extraction Test (WET)/STLC; and/or

3.2.3.4.3 Toxicity Characteristic Leaching Procedure (TCLP).

3.2.3.5 Hazardous Waste Determination: Based on the testing protocols, any waste containing greater than or equal to 5 ppm lead using WET/STLC or any waste containing greater than or equal to 1000 ppm using the TTLC test will be considered a California Hazardous Waste/Non RCRA waste. Wastes containing greater than 5 ppm lead using the TCLP analysis will be considered a hazardous RCRA waste. Wastes reported by the laboratory to contain more than 50 ppm and less than 1000 ppm using the TTLC test may still be hazardous waste and will require analysis using WET/STLC and/or TCLP tests.

3.2.3.6 Off-site Shipment of Wastes: The Contractor will notify the County in advance, whenever lead-containing waste materials are to be removed from the work-site. A copy of the Uniform Hazardous Waste Manifest or any other documents required by Federal, State or Local agencies shall be completed by the Contractor and submitted to the County for review and signature prior to transporting lead-containing waste materials to a disposal facility. The Contractor will provide the County with sufficient advance notice of the need to obtain manifest signatures, so as to not delay waste shipment, nor to otherwise impede the Project Schedule. The Project IH Consultant will have authority to sign or approve waste shipping documents on the County's behalf. It is the Contractor's responsibility to obtain the necessary authorized signature(s) to ship wastes off-site. Delays or expenses resulting from the untimely coordination of waste shipment documentation will be borne by the Contractor.

3.2.3.7 Waste Shipment Documentation: EPA Uniform Hazardous Waste Manifest forms will be used for all waste transported off-site for hazardous waste disposal. The Contractor will submit original "Generator" copies of all hazardous and non-hazardous waste manifests to the Project IH Consultant at the time the waste is transported off-site for disposal. All waste loads removed from the Project Site shall either be weighed by a Certified Weighmaster prior to delivery to a waste disposal facility or at the waste disposal facility. Weight tickets will be submitted by the Contractor as a part of the Post-Job Submittals. At the conclusion of the Work, the Contractor will provide documentation that the lead-containing waste materials were disposed of at an appropriate EPA-approved waste disposal facility. The documentation will be submitted as part of the Post-Job Submittals.

3.2.3.8 Waste Shipment Containers: All waste shipping containers will be individually labeled with appropriate signage and warnings, as required by applicable regulations, codes and ordinances. All waste hauling vehicles and/or waste debris bins will, at all times, be enclosed and sealed while in transport to a waste disposal facility.

3.2.4 Work Area Evaluation Criteria

3.2.4.1 General: The Contractor will not be authorized to de-mobilize from a Work Area until the Post-Work Inspection criteria have been met and documented, as described herein.

3.2.4.2 Post-Work Inspection Criteria: A visual evaluation of each regulated Work Area (including poly sheeting) will be performed following completion of the Work in order to the evaluate the substantial completion of the stated scope of work and the thoroughness of the Contractor's Work Area cleaning. Each regulated Work Area must be free of all visible debris to satisfy this assessment. If a regulated Work Area is not visibly free of all three-dimensional debris, the Contractor will re-clean the Work Area using wet-wiping and/or a HEPA-filtered vacuum until a satisfactory condition is achieved. The Contractor will be released only after each regulated Work Area has met the above criteria.

3.2.4.3 Optional Dust Wipe Sampling: At the discretion of the County, dust wipe sampling of a regulated Work Area may be conducted. The purpose of the dust wipe sampling will be to evaluate the effectiveness of the Contractor's containment measures. Sample analytical results will be compared to the lead dust concentrations established in 17 CCR §35035. If sample analytical results exceed the lead dust concentrations established in 17 CCR §35035 within the regulated Work Area, the Contractor will re-clean the Work Area using wet wiping and HEPA vacuums until satisfactory conditions are achieved.

END OF SECTION

ATTACHMENT - A

CERTIFICATE OF LEAD WORKER'S ACKNOWLEDGMENT

Project Name: _____

Today's Date: _____

Project Address: _____

Contractor's Name: _____

WORKING WITH LEAD CAN BE DANGEROUS TO YOUR HEALTH. INHALING LEAD DUST HAS BEEN LINKED WITH VARIOUS HEALTH PROBLEMS.

Your employer's contract for the above-named project requires that you: 1) be supplied with appropriate personal protective equipment, including respiratory protection, and be trained in its use; 2) that you be trained in lead-related construction work practices and in the use of the equipment used on this job; and 3) that you receive a medical examination. These things are to be provided at no cost to you.

RESPIRATORY PROTECTION: Your employer must provide you with training in the proper use of respirators and inform you of the appropriate type of respirator to be used on the above-named project. You must be provided access to the personal exposure sampling data used to determine the appropriate type of respirators selected for this work. You must also be provided access to the written respiratory protection manual issued by your employer. You must be equipped at no cost to you with the appropriate respirator for use on the above-named project.

TRAINING COURSE: Applicable regulations require that you be trained in the dangers inherent in working with lead and lead-contaminated dust and in proper work procedures and personal protective measures. The topics covered in the training must, at a minimum, include the following:

- The content of the Cal/OSHA Construction Safety Orders for Lead (8 CCR §1532.1, et. seq.) and its appendices;
- The specific nature of operations on this project that could result in exposure to lead above the action level;
- The purpose, proper selection, fitting, use, and limitations of respirators;
- The purpose, and a description, of the medical surveillance program, and the medical removal protection program including information concerning the adverse health effects associated with excessive exposure to lead;
- The engineering controls and work practices associated with the employee's job assignment including training of employees to follow relevant good work practices as described in Appendix B of 8 CCR §1532.1;
- The contents of any compliance plan and the location of regulated areas in effect;
- Information informing employees that chelating agents should not routinely be used to remove lead from their bodies and should not be used at all except under the direction of a licensed physician; and
- The employee's right of access to records under 8 CCR §3204.

In addition, the Contractor must ensure that all employees and supervisors who are engaged in lead-related construction work as defined in Title 17, California Code of Regulations, Section 35022, and have been shown to be exposed at or above the permissible exposure limit, meet the training requirements of this section, are trained by an accredited training provider and are certified by the California Department of Health Services.

(Continued on Back)

MEDICAL EXAMINATION: Applicable regulations require that you have a medical examination within the past 12 months and that it be provided at no cost to you. This examination must, at a minimum, include:

- Health history;
- Pulmonary function tests;
- Physical examination that pays particular attention to teeth, gums, and hematological, gastrointestinal, renal, cardiovascular and neurological systems;
- Blood pressure measurement;
- Blood sample - blood lead levels, hemoglobin and hematocrit, red cell indices, peripheral smear, morphology, blood urea nitrogen and serum creatine;
- Routine urinalysis with microscopic examination; and
- May include an evaluation of a chest X-ray

By signing this document you are acknowledging that you have been advised of your rights, as pertain to training and personal protection, and of the worker protection requirements applicable to your employer, the Contractor.

Signature: _____

Social Security No.: _____

Name: _____

Witness: _____

DOCUMENT 01 81 20

MISCELLANEOUS HAZARDOUS MATERIALS

PART 1 - GENERAL

1.1 SUMMARY

1.1.1 Scope of Work: Except as otherwise expressly specified herein, the Contractor will supply all labor, supervision, materials, equipment, tools, services, insurance and each and every item of expense necessary for the removal, handling, management, packaging, transportation and disposal/recycling of miscellaneous hazardous materials present at the site. Miscellaneous hazardous materials work must be performed as specified herein and in compliance with applicable federal, state and local regulations.

1.1.2 Miscellaneous Hazardous Materials: Miscellaneous hazardous materials that are, or may be present at the Site, include but may not be limited to fluorescent lamps/lights, mercury containing devices, light ballasts, hydraulic oils, and universal wastes.

1.1.3 Project IH Consultant: The County's Industrial Hygiene Consultant (hereinafter referred to as the "Project IH Consultant") will provide independent, third-party industrial hygiene/hazardous materials consulting services on behalf of the County. It is not the responsibility of the Project IH Consultant to supervise the Contractor; nor to direct the Contractor's work effort; nor to assume the management of, or responsibility for, the Contractor's health and/or safety practices, nor its waste management, nor its regulatory compliance. At all times, the Contractor is solely responsible for the quality and execution of all phases and aspects of the Work.

1.2 SUBMITTALS

1.2.1 General:

1.2.1.1 In addition to any other contractual submittals required of the Contractor, the Contractor will provide the submittals described in this Specification section. Submittals will be reviewed by both the County and the Project IH Consultant for acceptability. The Project IH Consultant will either recommend submittals to the County for acceptance, or will return them to the County as deficient, with notations for correction and re-submission. The Project IH Consultant does not have authority to "approve" submittals.

1.2.2 Schedule And Format:

1.2.2.1 Delivery: Submittals listed in this section must be delivered to the County.

1.2.2.2 Quantity: Six (6) identical, legible copies of each submittal listed in this section shall be delivered in an organized fashion suitable to the County for review. One (1) copy will be conveyed by the County to the Project IH Consultant for review.

1.2.2.3 Work Commencement: No portion of the Work shall be commenced by the Contractor until the submittals are reviewed and accepted by the County or their designated representative.

1.2.2.4 Delays: Delays to the Work resulting from the submittal of deficient or illegible documentation, or from the untimely submittal of potentially acceptable documentation, shall be the sole responsibility of the Contractor. Except as otherwise granted by the County, no extensions will be made to the awarded contract schedule or budget to accommodate such delays.

1.2.2.5 Format: Submittals will be provided in 8-1/2" x 11" format, with sections separated by numbered tabs indexed to a printed Table of Contents. Illegible submittals will be considered deficient and returned for correction.

1.2.2.6 Pre-work Submittals: Pre-work submittals shall be delivered to the County not less than ten (10) business days prior to the Contractor's mobilization onto the work site. The Project IH Consultant will review submittals and return deficient submittals within five (5) business days following their receipt. Deficient submittals must be resubmitted by the Contractor within five (5) business days after return of review copy. Once accepted, the reviewed copy will be returned to the Contractor, who must maintain a copy of the reviewed submittal at the job site. The following is to be submitted:

1.2.2.6.1 Worker Qualifications: Name and qualifications of each employee to be engaged in handling or removal of materials specified in this Section.

1.2.2.6.2 Technician Certification: The U.S. EPA requires that individuals who perform maintenance, service, repair, or disposal of ODCs be certified in accordance with Section 608 of the Clean Air Act, as amended (Section 608). The Contractor will submit documentation of certification for any technician or subcontractor to be in engaged in work covered by Section 608.

1.2.2.6.3 Worker Training: The Contractor shall provide current (within previous 12 months) valid documentation of worker training in accordance with Cal/OSHA Hazardous Waste Operations and Emergency Response (8 CCR §5192, "HAZWOPER") for any workers or subcontractors engaged in work specified in this Section. An exception to this training requirement will be made for workers or subcontractors engaged solely in work involving handling or disposal of ODCs.

1.2.2.6.4 Permits/Licenses: The Contractor is responsible for obtaining any permits or licenses and for making any regulatory notifications required to perform the work of this Section. The Contractor will deliver one (1) copy of all permits, approvals and notifications to the County at least 5 business days before beginning the Work of this Section.

1.2.2.6.5 Subcontractors: Submit qualifications and 24-hour contact information for each subcontractor to be used. This shall include two (2) legible copies of federal, state, and/or local business or operating permits, as well as State and/or EPA identification numbers for the waste transporters and disposal facilities to be used.

1.2.2.6.6 Waste Hauling Qualifications: Submit proof of hazardous waste transporter's registration and the vehicle operator training. Submittals shall include, but not necessarily be limited to: business name, address (mailing address and physical location), and business telephone number of the company; primary contact name and emergency contact (24-hour) telephone number; documentation of current State and/or EPA authorization to operate; and insurance coverage.

1.2.2.6.7 Waste Disposal Facility Qualifications: Submit documentation of the California State and/or EPA-approved waste recycling disposal and/or treatment facilities designated to receive shipments of hazardous and universal wastes generated during this project. Such information will include, but not necessarily be limited to: business name, address (mailing address and physical location), and business telephone number of the facility; primary contact name and emergency contact (24-hour) telephone number; documentation of current State and/or EPA authorization to operate; operator's facility I. D. number; classification and/or types of waste(s) accepted; name, business address and telephone number of insurance provider; documentation of insurance type(s), coverage amounts, and any limitations on liability; and any regulatory agency information pertaining to known citations issued, notices of violations issued, corrective actions ordered, Records of Decisions rendered, or on-going environmental investigations or known liabilities.

1.2.2.7 Post-work Submittals: The Contractor will, within 20 business days of demobilization from the Project Site, submit 2 copies of all waste disposal documentation (waste manifests, recycler's or reclaimer's receipts, or other applicable documentation) to demonstrate appropriate material management and disposal. If the Project IH Consultant or County determines that the Post-work Submittals are inadequate and/or require additional unanticipated review time, the Contractor will be required to correct the deficiencies and re-submit them for additional review.

1.3 QUALITY REQUIREMENTS

1.3.1 Reference Standards:

1.3.1.1 Regulations: Applicable regulations pertaining to this work include, but are not limited to, the following:

1.3.1.1.1 California Department of Occupational Safety and Health (Cal-OSHA) – General Industry Safety Orders Hazardous Waste Operations and Emergency Response (8 CCR §5192 et. seq.).

1.3.1.1.2 California Health & Safety Code Section 25163(c).

1.3.1.1.3 Title 22, California Code of Regulations, Section 66261.24 et. seq.

1.3.1.1.4 Title 22, California Code of Regulations, Section 66268.7(a)(4) et. seq.

1.3.1.1.5 Title 22, California Code of Regulations, Section 66268.114 et. seq.

1.3.1.1.6 California Safe Drinking Water and Toxic Enforcement Act of 1986 (Prop. 65).

1.3.1.1.7 Title 22, California Code of Regulations, Division 4.5, Chapter 23 – Universal Waste Rule - California Department of Toxic Substances Control (DTSC).

1.3.1.1.8 Title 40, Code of Federal Regulations, Part 61, Subpart M, National Emission Standards for Hazardous Air Pollutants (NESHAP). U.S. EPA.

1.3.1.1.9 Title 40, Code of Federal Regulations, Part 82, et. seq., Protection of Stratospheric Ozone. U.S. Environmental Protection Agency (U.S. EPA).

1.3.1.1.10 Title 40, Code of Federal Regulations, Part 761, et. seq., Polychlorinated Biphenyl (PCBs) Manufacturing, Processing, Distribution in Commerce and Use Prohibitions. U.S. Environmental Protection Agency (U.S. EPA).

1.3.1.1.11 Title 49, Code of Federal Regulations, Part 172, U.S. Department of Transportation.

1.3.1.1.12 All other applicable Federal, State, and/or Local regulations, codes, and ordinances.

1.3.1.2 Applicability. The most current version of each document shall apply. Where conflicts among these specifications exist, the more strict or stringent requirement or interpretation shall apply.

PART 2 - PRODUCTS

SECTION NOT USED

PART 3 - EXECUTION

3.1 PREPARATION

3.1.1 Examination of Conditions: The Contractor must carefully examine the work site before beginning work and report any previously undisclosed or special conditions to the County. Except as may be otherwise stipulated elsewhere in the Contract Documents, starting the Work shall be interpreted as implied acceptance of conditions as they exist.

3.1.2 Responsibility for Work: By commencing the Work, the Contractor acknowledges and agrees that he has sole and primary responsibility and obligation to the County to make inspections of his own work at all stages of the Work. This includes acknowledging and agreeing that he has sole responsibility to supervise or superintend the performance of the Work, and that said work will be in strict adherence to, and in compliance with, all applicable methods, materials, regulations, and required standards whether or not specified herein. Where conflicts arise between standards or regulations, the more stringent will apply.

3.1.3 Coordination of Work: The Contractor is responsible to coordinate all scheduling, phasing, and completion of the Work with the County and all other employers working on the job site. This includes the responsibility to make notifications or communications of hazards to other trades, as required by regulation.

3.1.4 Measurements and Quantities: The Contractor is responsible to field verify all measurements, dimensions and quantities before starting the Work. Discrepancies between plan and field dimensions or quantities must be reported to the County as soon as discovered.

3.2 HANDLING AND DISPOSAL OF FLUORESCENT LAMPS & MERCURY CONTAINING DEVICES

3.2.1 General: The Contractor is responsible for removing all fluorescent lamps and mercury-containing devices. Fluorescent lamps and mercury-containing devices are to be managed in accordance with the California DTSC's Universal Waste Rule. If fluorescent lamps become broken or damaged during removal and/or handling, broken lamps will be managed as hazardous waste as specified below.

3.2.2 The Contractor will manage fluorescent lamps and mercury-containing devices in the following manner:

3.2.2.1 Do not intentionally break or crush fluorescent lamps or damage them in any way. Take all feasible precautions to avoid inadvertent damage to fluorescent lamps.

3.2.2.2 Store intact lamps in a secure area protected from physical damage. Storage areas will be identified with legible signage stating "Universal Waste Area - Spent Fluorescent Lamps" or "Universal Waste Area", as appropriate.

3.2.2.3 Store lamps in packaging or containers that are designed to minimize breakage/damage during both storage and shipping. Label containers as "Universal Waste – Spent Fluorescent Lamps" or "Universal Waste" as

appropriate and mark each container with the date on which storage of said waste began.

3.2.2.4 Use a bill of lading that contains the following information when shipping fluorescent lamps to a recycler: name and address of generator, transporter, and recycler; number of lamps shipped; date of shipment and date of receipt by recycler; and obtain a dated signature of the receiving recycler. Deliver a copy of the original "Generator Copy" of the bill of lading to the County at the time lamps or devices are transported off-site.

3.2.2.5 Broken fluorescent lamps will be placed in sealed, vapor-tight containers/drums that are compatible with the waste being stored, for disposal as mercury-containing hazardous waste. The waste will be classified as a RCRA characteristic hazardous waste and must be labeled and stored in accordance with all applicable regulations.

3.2.2.6 Mercury-containing devices will be placed in sealed, vapor-tight drums (30-gallons or less) for disposal as mercury-containing universal waste and will be classified as characteristic hazardous waste. Mercury-containing devices must not be commingled with other wastes.

3.2.2.7 Damaged or leaking mercury-containing devices will be placed in sealed, vapor-tight containers/drums that are compatible with the waste being stored for disposal as mercury-containing hazardous waste. The waste will be classified as RCRA characteristic hazardous waste and must be labeled and stored in accordance with all applicable regulations. The Contractor will inform the Project IH Consultant and the County immediately upon discovery of spilled or released mercury. The Contractor will implement emergency spill containment and confinement measures using booms, barriers and/or absorbent materials, but will obtain and comply with the recommendations of the Project IH Consultant before concluding a mercury clean-up.

3.2.2.8 The Contractor will deliver to the County information relating to the transportation and recycling, or disposal of fluorescent lamps, and mercury-containing devices before the start of the Work. This information will include:

3.2.2.8.1 Name and address of fluorescent lamp recycler or dismantler that will accept fluorescent lamps, intact;

3.2.2.8.2 Name and address of the recycler that will accept mercury-containing devices, intact;

3.2.2.8.3 Name and address of the permitted facility that will accept broken fluorescent lamps and/or leaking mercury-containing devices as hazardous waste;

3.2.2.8.4 Copies of applicable authorization letters, licenses, and permits to operate for the facilities, to document that they are permitted

to accept the mercury-containing devices and fluorescent lamps and;

3.2.2.8.5 Name and address of the hazardous waste transporter that will transport leaking mercury-containing devices and/or broken fluorescent lamps to a permitted disposal facility, including EPA Identification Number and proof of permit, license, or authorization to transport hazardous waste.

3.2.2.9 Further requirements for disposal of leaking or damaged mercury-containing devices and/or broken fluorescent lamps are specified in Section 3.5 below.

3.3 HANDLING AND DISPOSAL OF ODCs AND ODC-CONTAINING EQUIPMENT

3.3.1 ODCs (including, but not necessarily limited to, "freon", chlorofluorocarbons [CFCs], hydrochlorofluoro-carbons [HCFCs] and their blends) from chillers, air conditioners and/or refrigeration equipment must be evacuated from their units to the vacuum level required by the Environmental Protection Agency (EPA) prior to opening the units and/or transporting the units within the site and/or off-site for disposal.

3.3.2 EPA prohibits venting of ODCs to the atmosphere. The Contractor, its employees and subcontractors engaged in handling ODCs will take all feasible precautions to comply with the requirements of Section 608 pertaining to prohibitions on atmospheric venting of ODCs.

3.3.3 All Federal, state and local regulations must be complied with when abating ODC-containing devices.

3.3.4 Firms who perform ODC removal must be licensed for CFC refrigerant recycling/recovery with the EPA. Technicians who perform ODC removal must be certified for CFC refrigerant recycling/recovery. In addition, all equipment used in the recycling/recovery process must have a current EPA Registration. Evidence of such licensing, certification and registration must be submitted with the Contractor's Pre-Work submittals.

3.3.5 The Contractor must send reclaimed refrigerant to an EPA-certified refrigerant reclaimer and must provide: name and address of transporter and refrigerant reclaimer; amount of refrigerant recovered and shipped; and, date of shipment and date of receipt by reclaimer.

3.4 HANDLING AND DISPOSAL OF BALLASTS CONTAINING PCBS OR DEHP

3.4.1 Prior to the removal of any lighting fixture, the Contractor will disassemble the fixture and inspect it for labeling indicating the absence or presence of PCBs in the ballast. All "T-8 type" ballasts and all ballasts designated on the label as 'No PCBs' must be recycled at a facility that is approved by the County. Unless labeled to the contrary, all other light fixture ballasts will be assumed to contain PCBs and will be managed accordingly. DEHP-containing ballasts shall be managed the same as PCB-containing ballasts.

3.4.2 Fixture disassembly and removal will be performed using approved methods and tools that will minimize damage to the fluorescent lamp and ensure a removal with the ballast intact and undamaged.

3.4.3 Once removed, PCB-containing ballasts and assumed PCB-containing ballasts must be placed in a labeled, leak-tight disposal container.

3.4.4 Once filled, the disposal container will be closed and properly labeled for temporary storage, transport, and disposal in accordance with all applicable regulations.

3.4.5 The Contractor will submit to the County written confirmation from the disposal/recycling facility stating which type of ballasts they will accept.

3.4.6 All drums containing PCB ballasts must be transported to an EPA-approved disposal/recycling facility.

3.4.7 Disposing of PCB-containing ballasts in landfills is prohibited by federal and state law. Drums containing PCB ballasts and other PCB-contaminated materials will be disposed of, recycled or otherwise treated at an EPA-approved facility. The Contractor will submit documentation verifying removal, transportation, and disposal/recycling at the approved facility.

3.4.8 Drums containing "Non-PCB" fluids, ballasts or capacitors must be disposed of at a legally permitted disposal/recycling facility. Contractor will submit documentation verifying removal, transportation, and disposal at the approved disposal/recycling facility.

3.4.9 Upon completion of the disposal of PCB-containing ballasts and/or other PCB-contaminated materials, the Contractor will deliver the following to the County:

3.4.9.1 Written certification from the disposal facility that the items being disposed of were delivered to, accepted, and destroyed by the disposal facility. Certificate must be signed by the person authorized by the disposal facility to accept PCB items for disposal.

3.4.9.2 Copies of all waste manifests.

3.4.9.3 Certificates of Destruction of Materials.

Further requirements for storage and management of PCB-containing ballasts and/or other PCB-contaminated materials are specified in Section 3.5 below.

3.5 WASTE MANAGEMENT AND DISPOSAL

3.5.1 General: The Contractor is responsible for the safe handling, storage and transportation of all hazardous waste generated by the Work. By commencing this work, the Contractor implicitly agrees to bear all costs arising from any claims, damages, losses, and/or clean-up expenses incurred which, as a result of the Contractor's negligence, result from a hazardous waste spill(s) or release(s) on the job-site and/or while hazardous waste is in transport to a waste disposal facility. The Contractor or its designated subcontract waste hauler will deliver all waste materials to an appropriately designated waste disposal facility that is acceptable to the County and which is permitted in accordance with applicable regulations.

3.5.2 Storage Facilities: The Contractor will assure that all waste (hazardous and non-hazardous) generated by the Work is stored in a secured manner until received at the waste disposal facility. Debris bins, storage enclosures, etc. will be locked overnight and whenever the Contractor is

off-site or unable to directly monitor their contents and management. The Contractor will ensure that the appropriate and required warning signs are posted on waste storage locations. The Contractor will be responsible to maintain the waste storage facilities in an orderly and well-kept condition at all times. The Contractor will conduct routine waste storage area inspections to assure that appropriate storage conditions are maintained. Waste is not to be co-mingled with stored non-waste material or equipment.

3.5.3 Off-site Shipment of Wastes: The Contractor will notify the County and the Project IH Consultant in advance, whenever hazardous waste is to be removed from the site. A copy of the Uniform Hazardous Waste Manifest or any other documents required by Federal, State or Local agencies shall be completed by the Contractor and submitted to the Project IH Consultant for review and signature prior to transporting hazardous waste materials to a disposal facility. The Contractor shall provide sufficient advance notice of the need to obtain manifest signatures, so as to not delay waste shipment or otherwise impede the project schedule. The Project IH Consultant has the authority to sign or approve waste shipping documents on behalf of the County. It is the Contractor's responsibility to obtain the necessary authorized signatures to ship wastes off-site. The original "Generator" copies of all manifests and waste documents will be given to the County or the Project IH Consultant at the time the waste is transported off-site. Delays or expenses resulting from the untimely coordination of waste shipment documentation shall be borne by the Contractor.

3.5.4 Waste Shipment Documentation: EPA Uniform Hazardous Waste Manifest forms will be used for all waste transported off-site for hazardous waste disposal. A non-hazardous waste Bill of Lading will be used for all waste transported off-site for disposal or recycling as non-hazardous waste. At the conclusion of the Work, the Contractor will provide documentation that the wastes were managed and disposed of appropriately. The documentation will be submitted as part of the Post-Job Submittals.

3.5.5 Shipment Containers: All waste shipping containers must be individually labeled with appropriate signage and warnings, as required by applicable regulations, codes and ordinances. All waste hauling vehicles and/or waste debris bins must, at all times, be enclosed and sealed while in transport to the disposal facility

3.5.6 Waste Characterization: Contractor is responsible for properly segregating wastes in preparation for waste characterization. The County's IH Consultant will perform all waste characterization sampling. Costs for waste characterization sampling will be paid for by the County.

END OF SECTION

DOCUMENT 01 91 13

GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. OPR and BoD documentation prepared by the County (Owner) and Architect/Engineer contains requirements that apply to this Section.

1.02 SUMMARY

A. This Section includes general requirements that apply to implementation of commissioning without regard to systems, subsystems, and equipment being commissioned.

B. Related Sections include the following:

1. Division 22, Section 22 08 00 Commissioning of Plumbing.

2. Division 23, Section 23 08 00 Commissioning of HVAC.

3. Division 26, Section 26 08 00 Commissioning of Electrical Systems.

1.2 DEFINITIONS

A. BoD: Basis of Design.

B. CxA: Commissioning Authority.

C. OPR: Owner's Project Requirements.

D. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.

E. TAB: Testing, Adjusting, and Balancing.

1.3 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the

commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner:

1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
2. Representatives of the facility user and operation and maintenance personnel.
3. The Architect/Engineer.

1.4 OWNER'S RESPONSIBILITIES

A. Provide the OPR documentation to the CxA and Contractor for use in developing the commissioning plan; systems manual; operation and maintenance training plan; and testing plans and checklists.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to, the following:

1. Coordination meetings.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Testing meetings.
4. Demonstration of operation of systems, subsystems, and equipment.

C. Provide utility services required for the commissioning process.

D. Provide the BoD documents, prepared by Architect/Engineer and approved by Owner, to the CxA and Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.5 CONTRACTOR'S RESPONSIBILITIES

A. Provide utility services required for the commissioning process.

B. Contractor shall assign representatives with expertise and authority to act on behalf of the Contractor and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:

1. Participate in construction-phase coordination meetings.
2. Participate in maintenance orientation and inspection.
3. Participate in operation and maintenance training sessions.
4. Participate in final review at acceptance meeting.

5. Certify that Work is complete and systems are operational according to the Contract Documents, including calibration of instrumentation and controls.
6. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
7. Review and approve final commissioning documentation.

C. Subcontractors shall assign representatives with expertise and authority to act on behalf of subcontractors and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:

1. Participate in construction-phase coordination meetings.
2. Participate in maintenance orientation and inspection.
3. Participate in procedures meeting for testing.
4. Participate in final review at acceptance meeting.
5. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to CxA for incorporation into the commissioning plan. Update schedule on a weekly basis throughout the construction period.
6. Provide information to the CxA for developing construction-phase commissioning plan.
7. Participate in training sessions for Owner's operation and maintenance personnel.
8. Provide updated Project Record Documents to the CxA on a daily basis.
9. Gather and submit operation and maintenance data for systems, subsystems, and equipment to the CxA, as specified in Division 1 Section "Operation and Maintenance Data."
10. Provide technicians who are familiar with the construction and operation of installed systems and who shall develop specific test procedures and participate in testing of installed systems, subsystems, and equipment.

1.6 CxA's RESPONSIBILITIES

A. Organize and lead the commissioning team.

B. Prepare a construction-phase commissioning plan. Collaborate with Contractor and with subcontractors to develop test and inspection procedures. Include design changes and scheduled commissioning activities coordinated with overall Project schedule. Identify commissioning team member responsibilities, by name, firm, and trade specialty, for performance of each commissioning task.

C. Review and comment on submittals from Contractor for compliance with the OPR, BoD, Contract Documents, and construction-phase commissioning plan. Review and comment on performance expectations of systems and equipment and interfaces between systems relating to the OPR and BoD.

D. Convene commissioning team meetings for the purpose of coordination, communication, and conflict resolution; discuss progress of the commissioning

processes. Responsibilities include arranging for facilities, preparing agenda and attendance lists, and notifying participants. The CxA shall prepare and distribute minutes to commissioning team members and attendees within **five (5) workdays of the commissioning meeting(s).**

E. At the beginning of the construction phase, conduct an initial construction-phase coordination meeting for the purpose of reviewing the commissioning activities and establishing tentative schedules for operation and maintenance submittals; operation and maintenance training sessions; TAB Work; and Project completion.

F. Observe and inspect construction and report progress and deficiencies. In addition to compliance with the OPR, BoD, and Contract Documents, inspect systems and equipment installation for adequate accessibility for maintenance and component replacement or repair.

G. Prepare Project-specific test and inspection procedures and checklists.

H. Schedule, direct, witness, and document tests, inspections, and systems startup.

I. Compile test data, inspection reports, and certificates and include them in the systems manual and commissioning report.

J. Certify date of acceptance and startup for each item of equipment for start of warranty periods.

K. Review Project Record Documents for accuracy. Request revisions from Contractor to achieve accuracy. Project Record Documents requirements are specified in Division 1 Section "Project Record Documents."

L. Review and comment on operation and maintenance documentation and systems manual outline for compliance with the OPR, BoD, and Contract Documents. Operation and maintenance documentation requirements are specified in Division 1 Section "Operation and Maintenance Data."

M. Prepare operation and maintenance training program and provide qualified instructors to conduct operation and maintenance training. Operation and maintenance training is specified in Division 1 Section "Demonstration and Training."

N. Videotape and edit training sessions.

O. Videotape construction progress including hidden shafts.

P. Prepare commissioning reports.

Q. Assemble the final commissioning documentation, including the commissioning report and Project Record Documents.

1.7 COMMISSIONING DOCUMENTATION

A. Index of Commissioning Documents: CxA shall prepare an index to include storage location of each document.

B. OPR: A written document, prepared by the Owner, which details the functional requirements of Project and expectations of how it will be used and operated. This document includes Project and design goals, measurable performance criteria, budgets, schedules, success criteria, and supporting information.

C. BoD Document: A document, prepared by Architect, that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

D. Commissioning Plan: A document, prepared by CxA, that outlines the schedule, allocation of resources, and documentation requirements of the commissioning process, and shall include, but is not limited to the following:

1. Plan for delivery and review of submittals, systems manuals, and other documents and reports. Identification of the relationship of these documents to other functions and a detailed description of submittals that are required to support the commissioning processes. Submittal dates shall include the latest date approved submittals must be received without adversely affecting commissioning plan.
2. Description of the organization, layout, and content of commissioning documentation (including systems manual) and a detailed description of documents to be provided along with identification of responsible parties.
3. Identification of systems and equipment to be commissioned.
4. Description of schedules for testing procedures along with identification of parties involved in performing and verifying tests.
5. Identification of items that must be completed before the next operation can proceed.
6. Description of responsibilities of commissioning team members.
7. Description of observations to be made.
8. Description of requirements for operation and maintenance training, including required training materials.
9. Description of expected performance for systems, subsystems, equipment, and controls.
10. Schedule for commissioning activities with specific dates coordinated with overall construction schedule.
11. Identification of installed systems, subsystems, and equipment, including design changes that occurred during the construction phase.
12. Process and schedule for documenting changes on a continuous basis to appear in Project Record Documents.
13. Process and schedule for completing prestart and startup checklists for systems, subsystems, and equipment to be verified and tested.

14. Step-by-step procedures for testing systems, subsystems, and equipment with descriptions for methods of verifying relevant data, recording the results obtained, and listing parties involved in performing and verifying tests.

E. Test Checklists: CxA**,** with assistance of the Architect/Engineer**,** shall develop test checklists for each system, subsystem, or equipment including interfaces and interlocks, and include a separate entry, with space for comments, for each item to be tested. Prepare separate checklists for each mode of operation and provide space to indicate whether the mode under test responded as required. Provide space for testing personnel to sign off on each checklist. Specific checklist content requirements are specified in Division 2 Specifications, as listed in Part 1 – General, 1.02, B in this section. Each checklist, regardless of system, subsystem, or equipment being tested, shall include, but not be limited to, the following:

1. Name and identification code of tested item.
2. Test number.
3. Time and date of test.
4. Indication of whether the record is for a first test or retest following correction of a problem or issue.
5. Dated signatures of the person performing test and of the witness, if applicable.
6. Individuals present for test.
7. Deficiencies.
8. Issue number, if any, generated as the result of test.

F. Certificate of Readiness: Certificate of Readiness shall be signed by Contractor, Subcontractor(s), Installer(s), and CxA certifying that systems, subsystems, equipment, and associated controls are ready for testing. Completed test checklists signed by the responsible parties shall accompany this certificate.

G. Test and Inspection Reports: CxA shall record test data, observations, and measurements on test checklists. Photographs, forms, and other means appropriate for the application shall be included with data. CxA shall compile test and inspection reports and test and inspection certificates and include them in systems manual and commissioning report.

H. Corrective Action Documents: CxA shall document corrective action taken for systems and equipment that fail tests. Include required modifications to systems and equipment and revisions to test procedures, if any. Retest systems and equipment requiring corrective action and document retest results.

I. Issues Log: CxA shall prepare and maintain an issues log that describes design, installation, and performance issues that are at variance with the OPR, BoD, and Contract Documents. Identify and track issues as they are encountered, documenting the status of unresolved and resolved issues.

1. Creating an Issues Log Entry:

a. Identify the issue with unique numeric or alphanumeric identifier by which the issue may be tracked.
b. Assign a descriptive title of the issue.
c. Identify date and time of the issue.
d. Identify test number of test being performed at the time of the observation, if applicable, for cross-reference.
e. Identify system, subsystem, and equipment to which the issue applies.
f. Identify location of system, subsystem, and equipment.
g. Include information that may be helpful in diagnosing or evaluating the issue.
h. Note recommended corrective action.
i. Identify commissioning team member responsible for corrective action.
j. Identify expected date of correction.
k. Identify person documenting the issue.

2. Documenting Issue Resolution:

a. Log date correction is completed or the issue is resolved.
b. Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any.
c. Identify changes to the OPR, BoD, or Contract Documents that may require action.
d. State that correction was completed and system, subsystem, and equipment is ready for retest, if applicable.
e. Identify person(s) who corrected or resolved the issue.
f. Identify person(s) documenting the issue resolution.

3. Issues Log Report: On a periodic basis, but not less than for each commissioning team meeting, CxA shall prepare a written narrative for review of outstanding issues and a status update of the issues log. As a minimum, CxA shall include the following information in the issues log and expand it in the narrative:

a. Issue number and title.
b. Date of the identification of the issue.
c. Name of the commissioning team member assigned responsibility for resolution.
d. Expected date of correction.

J. Commissioning Report: CxA shall document results of the commissioning process including unresolved issues and performance of systems, subsystems, and equipment. The commissioning report shall indicate whether systems, subsystems, and equipment have been completed and are performing according to the OPR, BoD, and Contract Documents. The commissioning report shall include, but is not limited to, the following:

1. Lists and explanations of substitutions; compromises; variances in the OPR, BoD, and Contract Documents; record of conditions; and, if appropriate,

recommendations for resolution. This report shall be used to evaluate systems, subsystems, and equipment and shall serve as a future reference document during Owner occupancy and operation. It shall describe components and performance that exceed requirements of the OPR, BoD, and Contract Documents and those that do not meet requirements of the OPR, BoD, and Contract Documents. It may also include a recommendation for accepting or rejecting systems, subsystems, and equipment.

2. OPR and BoD documentation.
3. Commissioning plan.
4. Testing plans and reports.
5. Corrective modification documentation.
6. Issues log.
7. Completed test checklists.
8. Listing of off-season test(s) not performed and a schedule for their completion.

K. Systems Manual: CxA shall gather required information and compile systems manual. Systems manual shall include, but is not limited to, the following:

1. OPR and BoD, including system narratives, schematics, and changes made throughout the Project.
2. Project Record Documents as specified in Division 1 Section "Project Record Documents."
3. Final commissioning plan.
4. Commissioning report.
5. Operation and maintenance data as specified in Division 1 Section "Operation and Maintenance Data."

1.8 SUBMITTALS

A. Commissioning Plan Prefinal Submittal: CxA shall submit **three (3) hard copies and an electronically formatted document** of pre-final commissioning plan. Deliver one copy to Contractor, one to Owner, and one to Architect. Present submittal in sufficient detail to evaluate data collection and arrangement process. One copy, with review comments, will be returned to the CxA for preparation of the final commissioning plan for construction.

B. Commissioning Plan Final Submittal: CxA shall submit **two (2) hard copies and two (2) sets of electronically formatted documents** of final commissioning plan. Deliver one hard copy and one set of discs to Owner, and one hard copy and one disc to Architect. The final submittal must address previous review comments. The final submittal shall include a copy of the prefinal submittal review comments along with a response to each item.

C. Test Checklists and Report Forms: CxA shall submit sample checklists and forms to Contractor quality-control manager and subcontractors for review and comment. Submit **three (3) hard copies and three (3) sets electronically formatted documents**

of each checklist and report form. Deliver one copy/set to Contractor, one to Owner, and one to Architect.

D. Certificates of Readiness: CxA shall submit Certificates of Readiness.

E. Test and Inspection Reports: CxA shall submit test and inspection reports.

F. Corrective Action Documents: CxA shall submit corrective action documents.

G. Prefinal Commissioning Report Submittal: CxA shall submit **two (2) hard copies and an electronically formatted document** of the prefinal commissioning report. Include a copy of the preliminary submittal review comments along with CxA's response to each item. CxA shall deliver one copy to Owner and one copy to Architect. One copy, with review comments, will be returned to the CxA for preparation of final submittal.

H. Final Commissioning Report Submittal: CxA shall submit **two (2) hard copies and two (2) sets of electronically formatted documents** of the final commissioning report. CxA shall deliver one hard copy and one set of discs to Owner, and one hard copy and one disc to Architect. The final submittal must address previous review comments and shall include a copy of the prefinal submittal review comments along with a response to each item.

1.9 QUALITY ASSURANCE

A. Instructor Qualifications: Factory-authorized service representatives, experienced in training, operation, and maintenance procedures for installed systems, subsystems, and equipment.

B. Test Equipment Calibration: Comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately whenever instruments have been repaired following damage or dropping. Affix calibration tags to test instruments. **Instruments shall have been calibrated within six months prior to use.**

1.10 COORDINATION

A. Coordinating Meetings: CxA shall **conduct weekly coordination meetings** of the commissioning team to review progress on the commissioning plan, to discuss scheduling conflicts, and to discuss upcoming commissioning process activities.

B. Pretesting Meetings: CxA shall **conduct weekly pretest meetings** of the commissioning team to review startup reports, pretest inspection results, testing procedures, testing personnel and instrumentation requirements, and manufacturers' authorized service representative services for each system, subsystem, equipment, and component to be tested.

C. Testing Coordination: CxA shall coordinate sequence of testing activities to accommodate required quality-assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

D. Manufacturers' Field Services: CxA shall coordinate services of manufacturers' field services.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 OPERATION AND MAINTENANCE TRAINING REQUIREMENTS

A. Training Preparation Conference: Before operation and maintenance training, CxA shall convene a training preparation conference to include Owner's operation and maintenance personnel, Contractor, and subcontractors. In addition to requirements specified, perform the following:

1. Review the OPR and BoD.
2. Review installed systems, subsystems, and equipment.
3. Review instructor qualifications.
4. Review instructional methods and procedures.
5. Review training module outlines and contents.
6. Review course materials (including operation and maintenance manuals).
7. Inspect and discuss locations and other facilities required for instruction.
8. Review and finalize training schedule and verify availability of educational materials, instructors, audiovisual equipment, and facilities needed to avoid delays.
9. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

B. Training Modules: Develop an instruction program that includes individual training modules for each system, subsystem, and equipment.

END OF SECTION

SECTION 02 00 00

EXISTING CONDITIONS

PART 1 - GENERAL

1.1 MAINTENANCE OF SITE ACCESS

A. Keep exit roads, entrance/exit gates, and roads and walkways to such gates, open during demolition and construction for access to site by County in addition to requirements of construction personnel. Provide temporary roads and walkways if required for access and exiting.

1.2 SUBMITTALS

A. When conditions encountered differ from those shown, submit proposed remedial methods for approval.

B. Cross-reference to Contract Documents includes shop drawings, samples and product data as appropriate.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials, Manufacturers and Fabrication: Comply with the requirements established by the Contract Documents.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect existing conditions and surfaces that will become substrates for, or contiguous surfaces with, the work under this Contract. Should deviations from tolerances established by the Contract Documents interfere with lines, levels or the tolerances established for the work under this Contract, corrections shall be made prior to commencement of adjacent new work.

B. A written list of conflicts and remedial requirements is required to be submitted within 10 days of the Notice to Proceed. Conflicts not identified at that time will be remedied at the Contractor's expense.

C. Where photographic or video media is utilized to record condition prior to the start of construction, submit two sets of media to the County for its records. See Division 01 for additional requirements.

3.2 WORKMANSHIP

A. Work shall be done in accordance with tolerances established by the Contract Documents.

END OF SECTION 02 00 00

SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Selective demolition and removal of the existing construction to the extent specified or indicated on the Drawings.
   2. Removal, salvage, cleaning, and storage of existing items indicated to be re-installed.
   3. Disconnecting, capping or sealing, and removing of utilities serving areas to be demolished.
   4. Contractor's Demolition Plan.

B. Related Requirements:
   1. Existing Conditions: Section 02 00 00.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or recycled.

B. Remove and Salvage: Detach items from existing construction and deliver them to County as directed. Where items are to be re-installed, they may be stored inside the existing building in area(s) to be designated by the County.

C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or recycled.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Submittals shall conform to the requirements of the following:
   1. County Document governing Hazardous Materials Procedures and Requirements.
   2. Section 01 33 00 Submittal Procedures.
   3. Section 01 35 13.26 Construction and Demolition Waste Management.

B. Pre-demolition Conference: Conduct conference at Project site. Review methods and procedures related to demolition including, but not limited to, the following:
   1. Inspect and discuss condition of construction to be demolished.
   2. Review and finalize Demolition Plan and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
   3. Review and finalize protection requirements.
   4. Review and finalize a list of items to be salvaged and re-installed.

5. At meeting, County's Representative will designate storage area(s) for salvaged items to be re-installed.

1.4 SUBMITTALS

A. Quality Control:
   1. Landfill Records: If applicable, indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
   2. Receipts for recycled materials that include name of licensed recycling company, dollar value, and date.
   3. Inventory: After demolition is complete, submit a list of items that have been removed, salvaged, and not required to be re-installed.

B. Pre-demolition Photographs: Show existing conditions, including finish materials and adjoining construction to remain, that might be misconstrued as damage caused by demolition operations and work under this Contract.
   1. File Format: Joint Photographic Experts Group (JPEG), unless otherwise directed by County's Representative.
   2. Minimum Resolution: 5 mega pixels.
   3. Provide digital date/time imprint on each picture.
   4. Digital images shall be exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
   5. Submit on recordable compact disks before Work begins.

C. Demolition Plan as specified below.

1.5 DEMOLITION PLAN

A. The Contractor shall submit a complete Demolition Plan detailing procedures and sequence for removing the existing construction in a safe and controlled manner.

B. The Demolition Plan shall consist of the following:
   1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
   2. Interruption of utility services.
   3. Coordination for shutoff, capping, and continuation of utility services.
   4. Details and locations of dust barriers or other protective measures in sufficient numbers to ensure that people, property, and improvements will not be endangered.
   5. Arrangements for keeping entrances open during demolition phase, to the extent requested by the County.

C. In the event that revisions to the Demolition Plan is required to be submitted for approval, the Contractor shall provide 14 calendar days for the review of substantial procedural and sequence modifications.

D. Review by the County's Representative of the Demolition Plan or field observations performed by the County's Representative will in no way relieve the Contractor of full responsibility for the Demolition Plan and procedure.

1.6 QUALITY ASSURANCE

A. Qualifications: Demolition shall be performed by personnel with experience in demolition work similar in material and extent to that indicated for this Project.

B. Regulatory Requirements:
   1. Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
   2. Certifications: Obtain and pay for any necessary permits from governing authorities.

C. Standards: Comply with ANSI A10.6 and NFPA 241.

1.7 PROJECT CONDITIONS

A. Promptly repair damage caused by demolition operations to existing structure, finishes, and facilities to remain at no cost to the County.

1.8 TRAFFIC

A. Conduct demolition operations and the removal of debris to ensure minimum interference with streets, walks, and adjacent occupied or used facilities and portions of the Building. Do not close or obstruct streets, walks, ramps, stairs, entrances, exit ways, or other occupied or used facilities without permission from authorities having jurisdiction.

B. Existing pedestrian crossings and sidewalks, and building stairs and ramps, shall be kept open at all times unless otherwise approved by the County.

C. Closings, if required, of City streets and walks shall be included in the Demolition Plan.

D. See Division 01 for additional temporary signage requirements and traffic requirements of the Site Utilization Plan.

1.9 TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE

A. If City street lane closures are required, comply with the provisions of Section 12, "Construction Area Traffic Control Devices," of the State of California Caltrans Standard Specifications (hereinafter referred to as the "Standard Specifications"), unless otherwise directed or required.

B. If any component in the traffic control system is displaced or ceases to operate or function from any cause during the progress of the work, the Contractor shall immediately repair said component to its original condition or replace said component and shall restore the component to its original location.

C. When lane closures are made for work periods only, at the end of each work period, all components of the traffic control system, except portable delineators adjacent to the traveled way, shall be removed.

1.10 UTILITY SERVICES

A. Shutting off and disconnection of utilities serving areas to be demolished shall be performed by scheduled shut-downs only. County will perform required survey and be responsible to turn off all utilities.

B. Maintain existing utilities, including fire and life safety, serving other areas of the building and indicated to remain, keep in service, and protect against damage during demolition operations.

C. Do not interrupt existing utilities serving adjacent occupied or used facilities except when authorized in writing by County.

D. Provide temporary services during interruptions to existing utilities as acceptable to the County.

E. Contractor shall verify that utilities are properly disconnected and sealed before starting demolition operations.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Survey existing conditions and correlate with requirements indicated to verify extent of demolition required.

B. Inventory and record the condition of any items required to be removed and salvaged.

C. When unanticipated mechanical, electrical, or structural elements are encountered, investigate and measure the nature and extent of the element. Promptly submit a written report to County's Representative.

D. Verify that hazardous materials have been remediated before proceeding.

3.2 PREPARATION

A. Existing Utilities: As part of Demolition Plan, locate and identify utilities serving the areas to be demolished.
   1. Arrange to shut off, disconnect, and/or seal utilities as acceptable to the County.
   2. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 REMOVED AND SALVAGED ITEMS

A. Where required by the Drawings or specified and when so directed to be salvaged, remove item to be salvaged in the most careful manner possible to avoid damage; and, if damaged, such items shall be restored to conditions satisfactory to the County's Representative.

B. If there are items to be removed and salvaged by Contractor prior to commencement of general demolition operations, they are identified on the Drawings.

C. Comply with the following:
   1. Clean salvaged items of dirt and demolition debris.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until delivery to County.
   4. Transport items to County as directed.
   5. Protect items from damage during transport and storage.

3.4 PROTECTION

A. Existing Facilities: Protect adjacent areas of the building, walkways, and other facilities during demolition operations.

B. Temporary Protection: Comply with requirements of Division 01.

C. Protect walls, windows, signage, roofs, and other adjacent interior and exterior construction that are to remain and that are exposed to building demolition operations.

D. Provide necessary temporary partitions, enclosure coverings, and the like for confining dust and debris to areas of the building in which demolition and/or alterations are being performed.

E. See additional requirements specified in Division 01.

3.5 DEMOLITION

A. Use methods required to complete the Work within limitations of governing regulations and as specified.

B. Do not use cutting torches until work area is cleared of flammable materials. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
   1. Maintain adequate ventilation when using cutting torches in confined spaces.
   2. Locate demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

C. Perform surveys as the Work progresses to detect hazards that may result from demolition activities.

D. Conduct demolition and debris-removal operations to ensure minimum interference with adjacent occupied and used facilities, with building access and circulation paths, and with site and City streets and walks.

E. Comply with governing environmental-protection regulations. Do not use water.

3.6 REMOVALS

A. Where required by the Drawings or specified and when so directed to be salvaged and/or reused, remove item to be salvaged in the most careful manner possible to avoid damage; and, if damaged, such items shall be restored to conditions satisfactory to the County's Representative.

B. Materials to be removed and not reused or salvaged shall become the property of the Contractor, who shall be responsible for their timely removal from the Project site and their legal disposal.

3.7 REPAIRS

A. Promptly repair damage to adjacent construction caused by demolition operations.

B. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

C. Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

3.8 RECYCLING DEMOLISHED MATERIALS

A. The recycling of demolition materials is encouraged and will be an evaluating item during review of the demolition plan.

B. Separate recyclable demolished materials from other demolished materials to the maximum extent possible. Separate recyclable materials by type.

C. Provide containers or other storage method for controlling recyclable materials until they are removed from Project site.

D. Transport recyclable materials off County's property and legally dispose of them. County's existing recycling collection facilities are not available for use by the Contractor.

E. Submit receipts for recycled and disposed materials as specified in Part 1.

3.9 DISPOSAL OF DEMOLISHED MATERIALS

A. Except for items or materials indicated to be recycled, salvaged, or otherwise indicated to remain County's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill. County's existing refuse collection facilities are not available for use by the Contractor.

B. Do not allow demolished materials to accumulate in the building.

C. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

D. Submit receipts for disposed materials as specified in Part 1.

3.10 CLEANING

A. Clean adjacent surfaces and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before building demolition operations began.

END OF SECTION 02 41 19

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The work includes, but is not necessarily limited to, the furnishing and installing of steel reinforcement for all concrete work as indicated on the Drawings and specified herein.

1.2 RELATED WORK

A. The general provisions of the Contract and Division 01 Specification Sections apply to the work specified in this section.

B. Related Work specified elsewhere:
   1. Section 03 30 00, Cast-in-Place Concrete.

1.3 QUALITY ASSURANCE

A. Reference Standards:
   1. American Concrete Institute (ACI):
      a. ACI 318, Building Code Requirements for Reinforced Concrete.
      b. ACI 315, Details and Detailing of Concrete Reinforcement.
      c. ACI 117, Standard Specifications for Tolerances for Concrete Construction and Materials.
   2. Concrete Reinforcing Steel Institute (CRSI):
      a. Recommended Practice for Placing Reinforcing Bars
      b. Recommended Practice for Placing Bar Supports, Specifications, and Nomenclature.
      c. Manual of Standard Practice.
   3. California Building Code (CBC), 2013 Edition.

B. Requirements of Regulatory Agencies: Special Inspection during placement of reinforcement is required in accordance with Chapter 17 of CBC, and shall be paid for by the County.

C. Welding Qualifications: Welders and procedures shall be qualified in accordance with AWS D1.4, Structural Welding Code – Reinforcing Steel.

1.4 SUBMITTALS

A. LEED Submittals: For products having recycled content, provide documentation indicating percentages of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.

B. Steel Reinforcing Shop Drawings: Submit shop drawings showing fabrication, bending and placing details for complete and accurate location of reinforcement.
   1. Details of reinforcement shall be in accordance with ACI 318 and ACI 315.
   2. Reinforcing steel shall not be fabricated or placed before Shop Drawings have been reviewed and returned to Contractor.

C. Welding certificates.

D. Material Certificates: Submit certified mill test reports and manufacturer's certification for each heat of steel used for reinforcing bars and mechanical splice devices.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver reinforcing bars in bundles with mill tags bearing heat numbers intact.

B. Pile reinforcement at site to prevent excessive rusting or fouling that will interfere with bond.

C. Store so as to maintain identification after bundles are broken.

PART 2 - PRODUCTS

2.1 GENERAL

A. Recycled Content: Provide products with an average recycled content of steel so post-consumer plus one-half pre-consumer recycled content is at least 25%.

2.2 STEEL REINFORCEMENT

A. Reinforcing bars: ASTM A615, Grade 60, deformed.

B. Low Alloy Steel Reinforcing Bars: ASTM A706, deformed.

C. Welded Wire Fabric: ASTM A185.

D. Tie Wire: ASTM A82.

2.3 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, bar supports, and other accessories as required in accordance with CRSI Manual of Standard Practice.
   1. Legs of accessories to be of type that will rest on forms without embedding into forms.
   2. Galvanize metal items that are exposed to moisture or use approved other non-corrodible, non-staining supports.
   3. Use plastic or plastic-coated accessories for supporting accessories at exposed concrete surfaces.

2.4 FABRICATION

A. Comply with details on Drawings and fabricate reinforcing in accordance with CRSI Manual of Standard Practice.

B. Reinforcing steel shall be cut and bent cold to exact lengths and shapes required.

C. Contractor is responsible for providing reinforcement that will comply with Contract Documents within tolerances specified.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with CRSI Manual of Standard Practice.

B. Reinforcement shall be free of paint, oil, dirt, scale or loose rust or coating that might reduce bond with concrete.

C. Prior to placing concrete, reinforcement shall be inspected and, if necessary, cleaned, relocated, and tied at no additional cost to County.

D. Provisions for Other Trades: Coordinate location of anchors, inserts, conduits, sleeves, and other items which are required to be cast in concrete and notify County's Representative when such embedded items interfere with placing of reinforcing steel before concrete is placed.

E. Securely tie rebar and support reinforcement to prevent displacement by construction traffic and during casting of concrete and to maintain minimum concrete cover. Displacement of reinforcement shall be immediately corrected.

F. Maintain reinforcement at proper distance from form face.

G. Tie wires shall be bent away from form.

H. Tack welding of reinforcement bars is prohibited.

I. Lap welded wire fabric at least one mesh width plus end extension of wires, but not less than six inches and lace wire fabric together at laps.

J. Reinforcement shall not be bent after being embedded in hardened concrete.

END OF SECTION 03 20 00

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Work includes, but is not necessarily limited to, the furnishing and placing of cast-in-place concrete as indicated on the Drawings and specified herein.

1.2 RELATED WORK

A. The general provisions of the Contract and Division 01 Specification Sections apply to the work specified in this Section.

B. Related Work specified elsewhere:
   1. Section 03 20 00, Concrete Reinforcing.

1.3 QUALITY ASSURANCE

A. The Contractor shall be responsible for:
   1. Installation of all accessories embedded in concrete necessary for execution of the work of other trades.
   2. Quality of concrete in place and shall bear burden of proof that concrete as placed meets minimum requirements.
   3. Patching or cutting made necessary by failure or delay in complying with these requirements shall be at Contractor's expense.

B. Reference Standards:
   1. American Concrete Institute (ACI):
      a. ACI 301, Specifications for Structural Concrete.
      b. ACI 304, Guide for Measuring, Mixing, Transporting and Placing Concrete.
      c. ACI 305, Hot-Weather Concreting.
      d. ACI 306, Cold-Weather Concreting.
      e. ACI 318, Building Code Requirements for Reinforced Concrete.
      f. ACI 211, Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
      g. ACI 233, Ground Granulated Blast-Furnace Slag as a Cementitious Constituent in Concrete.
      h. ACI 232R, Use of Fly Ash in Concrete.
      i. American Society for Testing and Materials.
   2. California Building Code (CBC), 2013 Edition.

C. Requirements of Regulatory Agencies: Special Inspection of concrete is required in accordance with Chapter 17 of CBC, and shall be paid for by the County. The Testing Agency shall not be affiliated with the concrete supplier.

D. Manufacturer Qualifications: Manufacturer of ready-mixed concrete shall comply with ASTM C94 requirements for production facilities and equipment and be certified by the National Ready-Mixed Concrete Association (NRMCA).

E. Source Limitations: Unless specifically approved by the County's Representative:
   1. All cementitious material shall be from the same plant, aggregates from a single source and admixtures from a single manufacturer.
   2. Material shall remain unchanged throughout the project.

1.4 SUBMITTALS

A. LEED Submittals:
   1. For products having recycled content, provide documentation indicating percentages of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.
   2. Submit design mixtures for each mix containing Portland cement replacement and for equivalent mixes that do not contain cement replacement.

B. Mix Designs: Submit certified copies of mix design for each concrete class specified, including compressive strength.

C. Shop Drawings: Show construction joint and control joint locations for review by County's Representative.

D. Test Reports: Testing Agency to submit Special Inspection reports of concrete compression, yields, air content, and slump test to County's Representative for review.

E. Material Certificates: Provide manufacturer's certification that the materials meet the requirements specified for cement, aggregate, admixtures, curing compounds, and grout.

F. Ready Mix Plant Certification: Submit copy of current certificate issued by NRMCA for the ready-mix plant supplying concrete.

1.5 DELIVERY, STORAGE AND HANDLING

A. Storage facilities shall be weather tight and dry.

B. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.

C. Store coarse and fine aggregate in separate, covered bins to prevent mixing and to preserve moisture content of aggregate at batching plant.

D. Store bulk cement in covered bins.

E. Use sacked cement in chronological order of delivery. Store each shipment so that it may be readily distinguishable from other shipments.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General Requirements:
   1. Cement and aggregates shall be from constant sources and shall have proven history of successful use with one another.
   2. Calcium chloride admixtures are not permitted.
   3. No frozen aggregates will be permitted.

B. Cements: ASTM C150, Type II.

C. Fly Ash: ASTM C618, Class F.

D. Ground Granulated Blast Furnace Slag (GGBFS): ASTM C989, Grade 120.

E. Normal Weight Aggregates: ASTM C33.
   1. Coarse aggregate: Fine grain, sound crushed stone, natural gravel or granite with cleanness value not less than 75 when tested as per Test Method Calif. 227.
   2. Fine Aggregate: Natural sand with sand equivalent of not less than 75 when tested as per Test Method Calif. 217-E.

F. Light Weight Aggregates: ASTM C330.

G. Water: ASTM C94 and potable, free from impurities detrimental to concrete.

H. Water-Reducing Admixtures: ASTM C494, Type A or Type D.

I. Other admixtures: Only with prior written approval by County's Representative and Testing Agency.

J. Non-shrink Grout: Premixed nonmetallic, non-staining grout requiring only addition of water at site.

K. Curing Materials:
   1. Curing Compounds: Clear, waterborne, membrane-forming compound complying with ASTM C309, Type 1, certified by the manufacturer to not impair bonding of floor covering.
   2. Absorptive Cover: Burlap cloth weighing approximately 9 oz. per sq. yd. and complying with AASHTO M182, Class 2.
   3. Moisture-retaining cover: One of the following complying with ASTM C171:
      a. Polyethylene film
      b. Polyethylene coated burlap

2.2 CONCRETE MIXES

A. General:
   1. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of trial batch data or field test reports, in accordance with ACI 301. Design of all concrete mixes shall be provided by a qualified concrete technologist hired and paid for by the contractor.
   2. Mix designs shall be subject to review by County's Representative and by Testing Agency.
   3. Use water-reducing admixture in concrete as required for placement and workability. Introduction of calcium chloride admixtures will not be permitted.
   4. Unspecified admixtures will not be permitted unless specifically approved by County's Representative and by Testing Agency.
   5. Strength: As indicated on Structural Drawings.
      a. Minimum compressive strength in psi after 28-days when tested in accordance with ASTM C39.
      b. To meet these requirements, mix shall be designed such that average compressive strength will exceed specified 28-day strength by an amount as specified by ACI 318.
   6. Slump: "Working limit" shall be 3-1/2 inches when tested in accordance with ASTM C143.
      a. This "working limit" is maximum slump for estimating quality of mixing water to be used in concrete.
      b. An "inadvertency margin" of one-half (1/2) inch is allowable deviation from "working limit" for such occasional batches of concrete as may inadvertently exceed "working limit".

B. Water to cementitious material ratio shall not exceed 0.45.

C. Fly Ash or Ground Granulated Blast Furnace Slag or a combination of two may be added to all concrete at the rate of 30% replacement by weight of scheduled amount of cement.

D. LWC shall have a unit weight of 110-115 lb/cu. ft. as determined by ASTM C567.

2.3 CONCRETE MIXING

A. Ready Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94 and provide batch ticket information.

B. Batching Plant Conditions: Ensure equipment and plant will provide accurate weighing, minimize segregation, and will efficiently handle materials to satisfaction of County's Representative and Testing Agency.

C. Thoroughly clean concrete equipment before use to avoid contamination.

D. Mix cement, fine and coarse aggregates, admixtures, and water to exact proportions of mix designs.

E. Measure fine and coarse grain aggregates separately according to approved method which provides accurate control and checking.

F. Maintain proportions, values, or factors of approved mixes throughout work.

PART 3 - EXECUTION

3.1 QUALITY CONTROL BY TESTING AGENCY

A. Inspections:
1. Construction of formwork is complete.
2. Placement of required reinforcement, inserts, and embedded items is complete.
3. Form ties at construction joints are tight.
4. Areas to receive concrete are free of debris and excess water.
5. Conveying equipment is clean and properly operating.
6. The required design mix is provided.
7. Concrete placement is performed in conformance with this Section.
8. Curing is performed in conformance with this Section.
9. Verification of concrete strength before form removal.

B. Concrete Tests: Comply with ACI 301 and the following:
1. Take sets for every 100 cubic yards of concrete or fraction for each mix design used each day. Cylinders shall be site cured in molds for 7 days at 60 degrees F or above. Subsequent to that they can be transported for Lab curing.
2. A total of six lab cured cylinders per set shall be tested as follows:
   a. 2 at 7 days
   b. 2 at 28 days
   c. 2 at 56 days (for Class A only)
3. Strength of concrete mix will be acceptable if the average of three consecutive strength tests exceeds the specified compressive strength and none of the values is less than 500 psi below the specified strength.

3.2 PREPARATION

A. Ensure availability of sufficient labor, equipment, and materials to place concrete correctly in accordance with schedule.

B. Verify that formwork, reinforcement, and embeds are in place and inspected before placing concrete.

C. Protect finished surfaces adjacent to areas to receive concrete.

D. Provisions for Other Trades: Coordinate location of anchors, inserts, conduits, sleeves, and other items which are required to be cast in concrete and make the necessary provisions for the placement of such embedded items.

E. Construction Joints:
   1. Verify location and conformance with typical details; provide only where designated or as approved by County's Representative.
   2. Continue reinforcement across construction joint unless otherwise noted.
   3. Form keyed joints as indicated on the Drawings
   4. Roughen construction-joint contact surfaces by sand-blasting to remove surface laitance and expose sound mortar and clean using compressed air.

F. Notify County's Representative and Special Inspector at least 48 hours before placing concrete.

3.3 PLACING

A. Do not add water to concrete during delivery, at the site, or during placement unless specifically approved by the County's Representative and Testing Agency.

B. Do not place concrete where sun, wind, heat, or facilities prevent proper finishing and curing.

C. Convey concrete as rapidly and directly as practicable to preserve quality and to prevent separation from rehandling and flowing. Place concrete as continuous operation to permit proper and thorough integration and to complete scheduled placement.
   1. Deposit concrete in horizontal layers as necessary, avoiding free falls in excess of 6 ft.
   2. Consolidate concrete in accordance with ACI 301 to ensure proper encasement of reinforcement, around embedded items and into corners.
   3. Take precautions to avoid displacement of reinforcement and formwork.
   4. Place concrete within 1 hour of adding water, unless otherwise specified.
   5. Retempering of concrete which is partially set will not be permitted.

D. Consolidating:
   1. Use mechanical vibrators for thorough consolidation of concrete.
   2. Provide vibrators at each point of deposit during simultaneous placing to ensure timely consolidation; ensure availability of spare vibrators in case of failures.
   3. Do not, place vibrators against reinforcement, attach to forms, or use to spread concrete.
   4. For exposed concrete, vibrate with rubber-type heads and, in addition, spade along forms with flat strap or plate.

E. Walls and Other Formed Elements:
   1. Placing procedures of concrete in forms that permit escape of mortar, or flow of concrete itself, will not be permitted.
   2. Level top surface upon stopping work.
   3. Space points of deposit to eliminate need for lateral flow.
   4. Take special care to fill each part of forms by depositing concrete directly as near final position as possible.
   5. Force concrete under and around reinforcement and embedded items without displacement.
   6. After concrete has taken its initial set, exercise care to avoid jarring forms or placing strain on ends of projecting reinforcement.
   7. Provide intermittent key indentations at all walls and a key indentation at each column.
   8. Keep forms and reinforcement clean above placement line by removing clinging concrete with wire brush before placing next lift.

F. Interruption in placement lasting longer than 45 minutes shall be cause for discontinuing placement for remainder of day.
   1. In this event, cut concrete back and provide construction joints as directed.
   2. Clean forms and reinforcement as necessary to receive concrete at a later time.

G. Hot-Weather Concreting: Conform to ACI 305 mean daily temperature rises above 90° F.

H. Cold-Weather Concreting: Conform to ACI 306 when mean daily temperature falls below 40° F.

3.4 CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
   1. Formed surfaces: Cure all formed surfaces including undersides of beams, supported slabs and similar surfaces by moist curing with forms in places. If forms are removed before end of curing period, continue curing for the remainder of the curing period.
   2. Unformed surfaces: Begin curing all unformed surfaces immediately after finishing.
   3. Start initial curing after placing of concrete and when free moisture has disappeared from concrete surface.
   4. Begin final curing procedures immediately following initial curing and before concrete has dried.
   5. Continue final curing for at least 7-days and in accordance with ACI 301.
   6. Avoid rapid drying at end of final curing period.

B. Curing Method: Cure concrete in accordance with ACI 308.1 by one or combinations of the following methods:
   1. Moisture Curing: Keep surface of concrete continuously wet by one of the following:
      a. Covering with water.
      b. Continuous water-fog spray.
      c. Covering concrete surfaces with specified absorptive cover, thoroughly saturating cover with water, and keeping absorptive cover continuously wet. Place absorptive cover with 12-inch lap over adjacent covers.
   2. Moisture-Cover Curing:
      a. Cover concrete surfaces with moisture-retaining cover for the duration of curing, placed in the widest possible width, with sides and ends lapped at least 12-inch and sealed by waterproofing tape or adhesive.
      b. Repair holes or tears during curing period using cover material and waterproof tape.
   3. Liquid Membrane Curing:
      a. Apply membrane-forming curing compound uniformly to damp concrete surfaces as soon as possible after final finishing operations are complete. Follow manufacturer's recommendations.
      b. Recoat areas which are subjected to heavy rainfall within 3-hours after initial application.
      c. Maintain continuity of coating and repair damage during curing period.
      d. Do not use membrane curing compounds on surfaces to receive floor coverings bonded to the concrete, liquid floor treatments, or other coating or finishing material applied directly to concrete, unless specifically approved by the County’s Representative.

C. Temperature of Concrete during Curing:
   1. When atmospheric temperature is 40°F. and below, cure in accordance with ACI 306.1, maintaining concrete temperature between 50°F. & 70°F. throughout curing period.
   2. When necessary, arrange for heating, covering, insulation or housing required to maintain specified temperature and moisture conditions during the curing period.
   3. When atmospheric temperature is 80°F. and above, cure in accordance with ACI 301.
   4. When necessary, arrange for installation of wind breaks or shading, and for fog spraying, wet sprinkling, or moisture-retaining covering.
   5. Maintain concrete temperature as uniformly as possible, and protect from rapid atmospheric temperature changes. Avoid temperature changes in concrete which exceed 5°F. in one hour, and 50°F. in 24-hour periods.

3.5 PROTECTION

A. Protect concrete from injurious action of elements and defacement of any nature during construction operations.

B. Protect exposed corners of concrete from traffic or use which will damage them in any way.

C. Protect finished concrete surfaces from damage by subsequent construction operations.

D. Make provisions to keep exposed concrete free from laitance caused by spillage or leaking forms or other contaminants.

3.6 MISCELLANEOUS CONCRETE ITEMS

A. Grouting Column Base Plates:
   1. The grouting of steel base plates, specified under Section 05 12 00 Structural Steel Framing, shall be performed as specified herein as part of this section.
   2. All grout used for the grouting of base plates shall be applied in strict accordance with manufacturer's directions.
   3. All grouting of bases shall be carefully done to make sure that all voids between the base plates and the concrete are completely filled with non-shrink grout.

B. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on the Drawings.

END OF SECTION 03 30 00

SECTION 03 54 15

PORTLAND CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Liquid-applied, high-strength, fast-setting, non-shrink cement underlayment for patching, filling, and leveling floors.

B. Related Requirements:
1. Tiling: Section 09 30 00.
2. Resilient Flooring: Section 09 65 00; resilient floor covering, concrete moisture testing requirements.
3. Tile Carpeting: Section 09 68 13.

1.2 ADMINISTRATIVE REQUIREMENT

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEEDTM Requirements.

1.3 ACTION SUBMITTALS

A. Product Data: Manufacturer's literature describing materials and specifications for mixing, placing, curing, and protecting.

1.4 INFORMATIONAL SUBMITTALS

A. Statement of applicator qualifications.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Approved, in writing, by manufacturer.

B. Mockups: Provide underlayment as required for mockups specified for applied floor coverings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

1.7 FIELD CONDITIONS

A. Ambient Conditions:
   1. Spaces to receive underlayment shall be maintained at a temperature above 40 degrees F before and during installation.
   2. During the curing process, ventilate spaces to remove excess moisture.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Portland Cement Underlayment: Basis of Design Manufacturer; Ardex Inc.

2.2 MATERIALS

A. Self-Leveling Underlayment: Non-structural, premixed blend of cement, graded aggregate, polymers, and control additives capable of being installed to feather edge.
   1. Basis of Design Products; "Ardex K 13" and "Ardex K 15" in pre-blended bag.
      a. Use "Ardex K 15 for minor patch and repair where floor mounted flush outlets will be relocated, and elsewhere where greater depth is required.
   2. Cure Time:
      a. Time is of the essence for installation of flooring materials and coatings.
      b. Moisture-Insensitive Tile: 6 hours.
      c. Other Floor Coverings: 16 hours; verify with manufacturer.
   3. Compressive Strength: 5,300 psi at 28 days, ASTM C109/mod – Air cure only.
   4. Flexural Strength: 1,000 psi at 28 days, ASTM C348

B. Floor Patching Filler: Basis of Design Product; "Ardex Feather Finish" for non-moving cracks and joints.

C. Primer:
   1. Absorbent Concrete: Basis of Design Product; "Ardex P 51 Primer" unless otherwise recommended by manufacturer for existing conditions.
   2. Non-Porous Substrates: Basis of Design Product; "Ardex P 82 Ultra Prime" unless otherwise recommended by manufacturer for existing conditions.

D. Water: Clean and potable, free from impurities detrimental to underlayment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate, and verify that surfaces are free from debris, oil, grease, wax, curing compounds, and dust and are reasonably clean and dry and that conditions are otherwise suitable to receive underlayment.

3.2 PLACING OVER CONCRETE

A. General:
   1. Use self-leveling underlayment to bring areas of substrate into levelness and flatness tolerances required for application of applied floor coverings.
   2. Follow manufacturer's technical bulletins for application of each product.
   3. Do not exceed thickness recommended by manufacturer for mix without aggregate or supplemental reinforcing.
   4. Select proper primer for condition of substrate, mix, and apply with rubber squeegee over entire surface.
   5. Pour or pump concrete compound in accordance with manufacturer's printed instructions.

B. Install self-leveling underlayment in one pour from feather edge spreading and screeding to a smooth surface.

C. Finish shall be as recommended by manufacturer for reception of specified finish materials.

3.3 CURING

A. Allow underlayment to harden as recommended by manufacturer. Do not allow traffic on underlayment during hardening period; minimum 2 hours or longer if special conditions exist.
   1. Do not load floors until reasonable strength has been achieved.
   2. Any loading on topping shall be distributed and not concentrated.

B. Maintain adequate ventilation and temperature above 50 degrees F until underlayment is dry.

3.4 ADJUSTMENT

A. Underlayment is subject to moisture testing specified in Section 09 65 00, “Resilient Flooring.”

B. Repair defects, evident after curing, that make underlayment an unacceptable substrate for finish flooring. Use materials recommended by underlayment manufacturer.
   1. Fill dimples.
   2. Sand down protrusions smooth and flush with adjacent surface.

END OF SECTION 03 54 15

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Work includes, but is not necessarily limited to, the furnishing and erection of all structural steel items complete, as shown and/or specified including:
   1. Furnishing of anchor bolts for structural steel columns and responsibility for their correct locations; provide templates.
   2. Brackets and miscellaneous iron connections shop-connected to structural members.
   3. Installing and removing temporary guys, shores, scaffolding and bracing required for steel erection.

1.2 RELATED WORK

A. The general provisions of the Contract and Division 01 Specification Sections apply to the work specified in this section.

B. Related Work specified elsewhere:
   1. Section 03 30 00, Cast-in-Place Concrete (for grouting of base and setting plates).
   2. Section 05 50 00, Metal Fabrications.
   3. Section 09 90 00, Painting and Coating.

1.3 QUALITY ASSURANCE

A. Reference Standards
   1. AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings, of the American Institute of Steel Construction, latest edition.
   2. AISC Code of Standard Practice for Steel Buildings and Bridges, latest edition.
   3. AISC Seismic Design Manual.
   4. AWS Code for Welding in Building Construction, D1.1 of the American Welding Society.
   5. Specifications for Structural Joints using ASTM A325 or A490 Bolts by the Research Council of Riveted and Bolted Structural Joints.
   6. Safety regulations prescribed by O.S.H.A.
   7. California Building Code, 2013 Edition.
   8. ANSI B18.22.1 – Plain Washers
   9. ASTM A 36/A 36M - Carbon Structural Steel.
   10. ASTM A 53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   11. ASTM A108 - Steel Bars, Carbon, Cold-Finished, Standard Quality.
   12. ASTM A 307 - Carbon Steel Bolts and Studs, 60 ksi Tensile Strength.

13. ASTM A 325 - Structural Bolts, Steel, Heat-Treated, 120/105 ksi Minimum Tensile Strength.
14. ASTM A354 - Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners
15. ASTM A490 - Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
16. ASTM A 500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
17. ASTM A 501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
18. ASTM A572/A572M - High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
19. ASTM A578/A578M - Straight-Beam Ultrasonic Examination of Plain and Clad Steel Plates for Special Applications.
20. ASTM A992/A992M - Steel for Structural Shapes For Use in Building Framing.
21. ASTM E329-02 Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
22. ASTM F436 - Hardened Steel Washers.
23. ASTM F959 - Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
24. FS TT-P-645 - Primer, Paint, Zinc-Molybdate, Alkyd Type.

B. Welding procedures, welders, welding operations and tackers shall be qualified in accord with the AWS Code.

1.4 SUBMITTALS

A. Shop Drawings: Indicate shop and erection details including cuts, copes, connections, holes, threaded fasteners and welds.

B. Proof of Compliance: Unless otherwise noted, submit the following in four (4) copies for review by County Representative and testing agency.

C. Certified reports of tensile properties and bend tests for steel shapes, bar, and plates.

D. Certificates of conformance for structural steel tubing.

E. Affidavit (in duplicate) that structural steel having a yield strength greater than 36 ksi conforms to requirements of Drawings and Specifications.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver anchor bolts and other anchorage devices which are to be embedded in the work of other trades to the project site in sufficient time to permit their timely installation. Provide proper setting drawings, templates and directions for installation of these items.

B. Structural steel members which are stored at the site or a staging area shall be above ground on platforms, skids, or other supports. Store fasteners and welding electrodes in a weather tight and dry place until ready for use. Store packaged materials in their original containers.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Metal Materials:
1. Wide-Flange Shapes: ASTM A992.
2. Angles and Plates: ASTM 572, Grade 50.
3. Other Structural Steel Shapes: ASTM A572, Grade 50, unless otherwise noted.
4. Hollow Structural Sections (HSS): ASTM A500 (cold formed), Grade B.
5. Structural Pipe: ASTM A53, Grade B or ASTM A501.
6. Standard Threaded Fasteners:
7. Threaded Rods: ASTM A572, Grade50.
8. Plain Washers: ANSI B18.22.1, Type A.
9. Beveled Washers: ASTM F436.
10. High Strength Bolts, Nuts and Washers: ASTM A325, Type 1, and ASTM A354 BD. See structural connection details for location of bearing-type and friction-type bolts.
11. Direct Tension Indicators (Load Indicator Washers): ASTM F959, Type 325.
12. Anchor Bolts: ASTM F1554, GRADE 36.
13. Welded Studs (Shear Connectors welded directly to Steel Frames): Low carbon, cold drawn, headed type steel shear connectors for stud welded installation, Fy = 50 ksi, Ft = 60 ksi, conforming to ASTM A108.

B. Other Materials:
1. Welding Electrodes: E7OXX low hydrogen.
2. Structural Steel Primer Paint: Zinc chromate alkyd primer (TT-P-645), except as otherwise recommended by the manufacturer of the coating for exposed steel.

2.2 FABRICATION

A. Fabricate structural steel within tolerances specified under Codes and Standards referenced in Article entitled “Reference Standards.”

B. Fabricate and assemble structural steel in the shop to the greatest extent possible. Do shearing carefully and accurately using machine equipment where possible.

C. Connections shall be welded or bolted as indicated. Shop connections not otherwise shown shall be welded. Eccentric connections are not permitted unless shown in detail on shop drawings.

D. Surfaces required to be milled or planned are indicated on the drawings.

E. Provide bearing plates for members bearing on footings, piers, and walls.

F. Drift pins may be used for assembling parts provided metal is not distorted or holes enlarged. Holes requiring enlargement to admit bolts shall be reamed. Misaligned holes will subject members to rejection.

G. Welding:

H. Perform welding in accord with appropriate Section of Reference Standards.

I. In addition to specific requirements of Drawings, details of welded joints shall comply with requirements for joints which are accepted without qualification tests under the AWS Code.

J. High Strength Bolted Construction: See Part 3 - Execution.

K. Shop Cleaning: Thoroughly clean loose mill scale, rust, dirt, grease and other foreign matter from structural steel shapes.

L. Shop Painting: Shop paint structural steel work except structural steel which is designated to receive spray fireproofing. Coordinate the use of primer paint on the steel with Architectural Drawings and fire ratings.
   1. Surface Preparation: After inspection and before shipping, clean steel work to be painted. Remove loose rust, loose mill scale, and spatter slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) SP-2, SP-3, or SP-7.
   2. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide uniform dry film thickness on 1.5 mils. Use painting methods which will result in full coverage of joints, corners, edges, and exposed surfaces.

PART 3 - EXECUTION

3.1 CONDITION OF SURFACES

A. Before starting work, verify locations and elevations of bearings and anchor bolts. Immediately report inaccuracies. Work under this Section shall include responsibility for accurate bearing of steel and correct location of anchorage.

3.2 ERECTION

A. Erect items of structural steel in accord with applicable provisions of Article entitled “Reference Standards”.

B. Erection Tolerances: Structural Steel work erection tolerances shall be in accord with "AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings" and "AISC Code of Standard Practice for Steel Buildings and Bridges".

C. Field connections shall be welded or bolted as indicated.

D. Bolting:
   1. As erection progresses, bolt up work to take care of dead loads, construction live loads, lateral forces and erection stresses.
   2. Unless otherwise noted, erection bolts used in welded construction may be either tightened securely and left in place or removed and the holes filled with plug welds.

E. High Strength Bolting:
   1. Make high strength bolted connections in accord with Reference Standard for "friction-type" connections with threads excluded from shear plane for bearing-type connections.
   2. Contact surface with "slip critical (friction) type" connections shall be free of oil, paint, lacquer, or other coatings.
   3. Tighten nuts using Direct Tension Indicators. Minimum bolt tension as per Reference Standard for each bolt type and size used. Use beveled washers to compensate for parallelism when outer face of bolted parts has a slope greater than 1:20 with respect to a plane normal to the bolt axis.
   4. When bolts have been completely tightened, mark with identifying symbol.

F. Temporary Bracing: Introduce wherever necessary to provide for loads to which structure is subjected including erection equipment and its operation. Leave in place until no longer required for safety. Make proper provisions for construction loads, piles of materials, equipment, etc., carried by structural frame during erection.

3.3 QUALITY CONTROL, TESTS AND INSPECTIONS

A. County-Hired Testing Agency: Testing and inspection shall be as required by Drawings as well as these Specifications. Testing and inspection of structural steel will be paid for separately by Owner as specified in Division 01 Specification Sections, except as follows:
   1. It is assumed that steel will be fabricated within the State of California. Transportation costs and per diem living costs for inspection at fabricator's plants outside of California will be back-charged to the Contractor.
   2. It is assumed that fabrication will take place in one shop location only. Additional inspection costs resulting from fabrication at more than one shop location will be back-charged to the Contractor.
   3. Mill tests and costs of retests of plain materials shall be at expense of Contractor.

B. Tests for structural steel will be made and reports furnished by County-hired testing agency in accord with the following requirements:
   1. Test of Mill Order: Where steel, ordered from mill, cut to lengths, is identified by heat or melt numbers and is accompanied by mill analysis test reports, material may be used without further local tests, provided an affidavit is given that materials conform with requirements. In case of controversy, tension and bend

tests of materials, either locally or at the mill, as required for local stock is mandatory, in which case, such testing will be back-charged to the Contractor.

2. Test of Unidentified Steel: In the event that structural steel cannot be identified by heat or melt numbers and is accompanied by mill analysis and test reports, such stock may be used, provided one (1) tension and (1) bend test is made for each 50 tons or fractional part, of stock as may be used in the work. Complete four-sided surface inspection may be required for materials. Each piece of high-strength local stock steel will be tested and stamped. Costs of such testing will be back-charged to the Contractor.
    a. Contractor shall take test Specimens under direction of County-hired testing agency and shall be machined by the Contractor, at Contractor's expense, to dimensions as required by related applicable Standard ASTM Specification.
3. Tests of Welding and Bolting: County-hired testing agency will inspect shop and field welding and inspect high tensile bolting. County-hired testing agency will comply with regulations of the California Building Code and will certify in writing, upon completion of work, that welding and high tensile bolting has been performed in accord with Drawings and Specifications and applicable Article entitled "Reference Standards".
4. Inspection of high Tensile bolts: County-hired testing agency will check bolt tightness on 100 percent of bolts.
5. Continuous Inspection of Welds: County-hired testing agency will inspect welded connections of column-to-column, column-to-girder, or girder-to-girder by ultrasonic or other approved non-destructive tests.
6. Ultrasonic testing will be performed by a specially trained, qualified technician, who will operate equipment, examine welds and maintain a record of welds examined, defects found and disposition of each defect. Defective welds shall be repaired and costs of retesting defective welds shall be borne by the Contractor.
    a. Welds requiring ultrasonic testing will be tested at the rate of 100 percent.
    b. When ultrasonic indication arising from the weld root can be interpreted as either a weld defect or backing strip, backing strip shall be removed at expense of Contractor, and if no root defect is visible, weld will be re-tested. If no defect is indicated on this retest and no significant amount of base and weld metal have been removed, joint needs no further repair or welding. If a defect is indicated, it shall be repaired at no expense to County.
    c. Questionable root indications that prove not to be defective will not count against welder to increase test rates.
    d. Ultrasonic instrumentation will be calibrated by a qualified technician to evaluate quality of welds in accord with AWS D1.1, Appendix C.
7. Other methods of inspection, for example, X-ray, gamma ray, magnetic particle, or dye penetrant, may be used on welds if deemed necessary by County-hired testing agency with cooperation of Contractor.
8. Ultrasonic Material Inspection:
    a. All column material within 1 foot (6 inches either side) of a direct buttweld for girder flange connections will be ultrasonically tested for laminations in accord with ASTM A578-Level II.

b. Material in designated location will be tested for laminations by ultrasonic means prior to fabrication, with written reports submitted to A/E.

9. Detection of Laminations: Rejectable defect discovered by ultrasonic means are defined as follows: Using suitable calibrated ultrasonic equipment, any recordable discontinuity causing complete loss of back-reflection and which cannot be encompassed within a 3-inch diameter circle is unacceptable (Level II Standard of Acceptance). Should such flaws be detected, they may be repaired by welding, subject to A/E's review.
10. All full penetration groove welds, all partial penetration groove welds and all electroslag welds will be subjected to ultrasonic testing.

END OF SECTION 05 12 00

SECTION 05 31 00

METAL DECKING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Work includes, but is not necessarily limited to, the furnishing and installing of steel deck work, including headed type welded studs (shear connectors) whether welded through the decking or directly to the structure, and accessories. This Section also includes miscellaneous metal supports required for the proper installation of steel decking and which are not shown on the Drawings or specified elsewhere.

1.2 RELATED WORK

A. The general provisions of the Contract and Division 01 Specification Sections apply to the work specified in this section.

B. Related Work specified elsewhere:
1. Section 03 20 00, Concrete Reinforcing.
2. Section 03 30 00, Cast-in-Place Concrete.
3. Section 05 12 00, Structural Steel Framing.
4. Section 05 50 00, Metal Fabrications.
5. Section 09 90 00, Painting and Coating.

1.3 QUALITY ASSURANCE

A. Reference Standards:
1. "Specifications for the Design of Light Gage Cold Formed Steel Structural Members" of the American Iron and Steel Institute (AISI).
2. AWS D1.1 Structural Welding Code – Steel.
3. AWS D1.3 Structural Welding Code – Sheet Steel.
4. California Building Code, 2013 Edition.
5. ASTM A36/A36M - Carbon Structural Steel.
6. ASTM A108 - Steel Bars, Carbon, Cold-Finished, Standard Quality.
7. ASTM A466/A466M - Weldless Chain.
8. ASTM A653/A653M - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
9. ASTM A1008/A1008M - Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

1.4 SUBMITTALS

A. Shop and Erection Drawings: Indicate layout and erection details including welds, mechanical fasteners, studs, clips, reinforcement, flashings, and closures and accessories which are to be applied or installed under this section.
   1. Review of drawings will cover only the general scheme and character of details but not the checking of dimensions; nor will such review relieve the Contractor from responsibility for executing the Work in accordance with the Drawings.

B. Submit certified mill analysis and test report for each heat for review by the County-hired testing agency.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Decking:
   1. Base Metal: Steel decking shall be formed from sheet steel conforming to ASTM A1008 or A 466 and having a minimum yield strength of 33,000 psi.
   2. Coating: Sheets shall have received, before being formed, a hot-dipped, zinc protective coating meeting or exceeding the requirements of ASTM A653 for G60 Coating Designation with not less than 0.60 oz. of zinc per sq. ft. of sheet (Triple Spot Test). For sheets exposed to weather, galvanizing shall meet G90 designation.
   3. Physical Properties: Drawings indicate sectional profiles, depths, and minimum gages required.
   4. Manufacturer: Verco Manufacturers Inc., the ASC Company, or equal.
   5. Steel deck manufacturer shall supply decking free of lubricants or oils which would significantly impair the adhesion of sprayed fireproofing.

B. Miscellaneous Metal Items (as required): ASTM A36, shop primed if not encased in concrete or sprayed with fireproofing. Where exposed to weather, apply coating in accordance with Section 09 90 00.

C. Accessories:
   1. Flashings, Closures, and Screeds: Galvanized sheet steel as specified for decking, 16 gauge.
   2. Venting Devices: Deck units having concrete fill and which are to receive waterproof membranes or weatherproof coatings (roofing, elastomeric coatings, etc.) shall have provisions incorporated into deck fabrication or installation for venting moisture. Individual separating clips, or built-in venting slots formed as an integral part of deck profile, per deck manufacturer's recommendations.

D. Welding Electrodes and Equipment: As recommended by deck manufacturer and approved for use in accordance with Article "References, Codes, and Standards".

E. Welded Studs: Low carbon cold drawn, headed steel shear connectors for stud welded installation and having a min. yield strength of 50,000 psi and a min. tensile strength of 60,000 psi (ASTM A108, Type-B). Studs shall not be painted or galvanized.

2.2 FABRICATION

A. Composite Construction: Decking designed for composite construction shall be formed with shear lugs to provide mechanical key to transfer horizontal shear and to prevent vertical separation with either interlocking side laps or lapping type sidelaps.

PART 3 - EXECUTION

3.1 INSPECTION OF STRUCTURE

A. Verify that supports for decking are properly aligned and sufficiently level to permit proper bearing and report any discrepancies. Proceeding with final installation implies acceptance of conditions.

3.2 ERECTION

A. Erect decking as per governing codes, drawing requirements and manufacturer's specifications and recommendations.

B. Ship deck units to job site in standard widths and cut to proper lengths such that end joints occur over supporting members. Perform field cuts as required.

C. Place deck units on supporting framework and adjust to final position with proper bearing before permanently fastening. Provide a minimum bearing of 2-1/2 inches over supporting beams.

D. Place units in straight alignment for entire length of flute run with close alignment between flute ends.

E. Provide flashings and closure where required to prevent concrete leakage. Fasten in place by welding.

F. Make welds in accord with provisions of AWS Code. Use only welders certified for welding in light gauge metal.

G. Opening reinforcement shall be as detailed on the Drawings. Cutting of holes other than those detailed on the Drawings shall be done only as specifically approved by the Design Build General Contractor. Show holes on shop drawings and coordinate required openings. Holes not shown on Structural Drawings shall be cut and reinforced in accord with details on Drawings. In general, reinforcing is not necessary for holes 6 inches or less in diameter.

H. Touch up abrasions and damaged areas in galvanized coating and painted coatings on metal deck and miscellaneous metal items.

I. Remove welding ferrules and flux from welded studs using a wire brush.

3.3 HANGER LOADS

A. The load on any wire hanger shall not exceed 50 pounds. The total load from all hangers or a single hanger with adequate spreader plate on a deck unit shall not exceed 100 pounds. Do not place such loads within the middle half of deck spans.

3.4 CLEAN-UP

A. After erection, remove metal cuttings and construction debris from flutes for entire length. Remove grease, oil, and other foreign material. Leave deck and cells in proper condition for obtaining bond with concrete fill and spray fireproofing.

3.5 QUALITY CONTROL, TESTS AND INSPECTIONS

A. Testing agency will review mill test reports, welding procedures, qualification of welders and deck and stud welding during erection. Cost associated with retests, qualification of welders and tests of unidentified material will be at Contractor's expense.

B. Qualification of welders for stud shear connectors shall conform to AWS D1.1. Such qualification procedures shall be performed prior to actual use on project.

C. Testing and inspection of steel studs welded through the steel deck to structural steel below will be in accordance with Section 7, Stud Welding, AWS D1.1 including application qualification requirements. Five percent (5%) of the studs will be bend tested in accordance with Paragraph 7.6.6.1. Each bend-tested stud shall have an additional stud of the same size welded adjacent to it whether the tested stud fails or not. All additional studs shall be paid for by the Contractor.

D. If material is not identified by certified mill analysis and test reports, one set of tension and bend tests will be made by the testing agency for each 5 tons or fraction thereof for each size or gage. Costs of such testing shall be paid by the Contractor.

END OF SECTION 05 31 00

SECTION 05 5000

METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Ladders (if required).
2. Custom-fabricated connectors and plates.
3. Abrasive strips and nosings for stair treads and landings, if not provided under Section 05 71 00 Decorative Metal Stairs.
4. Miscellaneous framing and supports.

B. Related Requirements:
1. Structural Steel Framing: Section 05 12 00.
2. Decorative Metal: Section 05 70 00.
3. Decorative Metal Stairs: Section 05 71 00.
4. Painting and Coating: Section 09 90 00.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.

B. Coordination:
1. Furnish setting drawings, diagrams, templates, and directions for installing anchorages, including sleeves, inserts, anchor bolts, and items with integral anchors, to be embedded in concrete.
2. Coordinate fabrication schedule with construction progress to avoid construction delays.
3. Coordinate with other construction in order to ensure that actual dimensions correspond to established dimensions.

1.3 ACTION SUBMITTALS

A. Shop Drawings:
1. Large-scale drawings for fabrication and erection of assemblies not completely shown by manufacturer's product data.
a. Include, as appropriate, plans, elevations, complete details, thicknesses, sizes, types, grades, classes of metal, connecting and joining methods, anchorages.
b. Show required field measurements and interface with work of other Sections.

c. Welds, both shop and field, shall be indicated by AWS "Symbols for Welding, Brazing and Nondestructive Examination," A2.4.
d. Indicate all required field measurements.

2. Setting drawings, templates, instructions, and directions for installation of anchorage devices.

B. Product Data: Manufacturer's specifications for manufactured products to be used in the fabrication of work, including paint products, bolts, and other exposed hardware.

C. Sustainable Design (LEED):
1. General:
a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
b. Sustainable design submittals are in addition to other submittals.
c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
2. The following information shall be provided:
a. Credit MR 4:
1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

D. Samples; Manufactured Products: Only as requested by County's Representative.

1.4 INFORMATIONAL SUBMITTALS

A. Certification for each welder.

B. Completed "Procedure Qualification Record" (PQR) and "Welding Procedures Specification" (WPS) forms for the welds to be performed under this Specification in accordance wtih AWS D1.1. Weld procedure qualification shall be for the same paint to be welded through in project work.

C. Mill test reports certifying physical and chemical properties for each lot of A325 and A449 anchor bolts to be delivered to the site.

D. Engineering Data: Before any elements requiring additional framing, support or bracing are fabricated, submit calculations verifying compliance with structural design criteria by design engineer and showing reactions to structure. Although all calculations shall be submitted, only reactions to structure are subject to review.

E. Certification: Submittal drawings, if not signed by design engineer, shall be certified that structural portion of drawings are in compliance with design calculations.

1.5 QUALITY ASSURANCE

A. Design Engineer: Professional structural or civil engineer registered in the State of California or shall otherwise be acceptable to governing authorities. Design engineer shall be experienced in providing engineering services of the kind indicated.

B. Comply with recommended practices of the National Association of Architectural Metal Manufacturers (NAAMM) and Section 10 of the AISC Code of Standard Practice.

C. Welding:
   1. Qualifications: Certified and qualified in accordance with AWS D1.1.
   2. Procedures and operations shall comply with AWS "Standard for Welding Procedure and Performance Qualifications," B2.1.
   3. Comply with AWS publication "Welding Zinc Coated Steel" for galvanized products.
   4. Welding inspector's qualifications shall be in accordance with AWS D1.1.

D. Wedge-type and expansion-nut concrete anchors, resin/adhesive anchors, and headed concrete anchors shall be ICC-ES approved.

E. Testing/inspection agencies shall be in conformance with ASTM E329.

F. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

G. At stairs, steps, platforms, and landings, comply with the requirements of the CBC and ADA for tread striping. Coordinate with other Sections.
   1. Abrasive strips, if used, shall meet requirements of California Title 24.

H. Gratings (If Used):
   1. Section properties shall be computed in accordance with AISI S100.
   2. Slip resistance shall be in conformance with FS RR-G-1602B.

I. Mockups: Provide metal fabrications for mockups specified in other Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect steel from corrosion.

B. Store packaged materials in original unbroken package or container.

C. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

1.7 FIELD CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on shop drawings. Allow for trimming and fitting wherever taking of field measurements before fabrication might delay work.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabrication without field measurements.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. Regulatory Requirements:
1. Comply with the Americans with Disabilities Act (ADA).
2. Comply with the CBC.

B. Design interface and connections to existing work in such a way as to minimize damage and defacement to existing construction. Give particular attention to historic items.

C. Recycled-content Materials:
1. Steel fabrications shall contain a minimum of 60 percent recycled content by weight, calculated by adding the post-consumer recycled content percentage to one-half of the pre-consumer recycled content percentage.
2. Aluminum fabrications shall contain a minimum of 25 percent recycled content by weight, calculated by adding the post-consumer recycled content percentage to one-half of the pre-consumer recycled content percentage.

D. Regional Materials: If available, furnish materials extracted, processed, and manufactured within 500 miles of Project.

2.2 METAL MATERIALS

A. Steel:
1. Steel Shapes, Bars, and Plates: ASTM A36.
2. Steel Plates to Be Bent or Cold Formed: ASTM A283, Grade C.
3. Pipe: ASTM A53, Grade B, Schedule 40.

4. Steel Bars and Bar-Size Shapes: ASTM A663, Grade 65, or ASTM A36.
5. Cold-Drawn Steel Tubing: ASTM A500, Grade B.
6. Hot-Rolled Carbon-Steel Bars: ASTM A575, grade as selected by fabricator.
7. Steel Castings: ASTM A27, Grade 65-35, medium-strength carbon steel.

B. Aluminum: 6063-T5 extruded alloy, ASTM B221.

2.3 OTHER MATERIALS AND COMPONENTS

A. Pipe Fittings: Malleable iron ASTM A47, grade 32510.

B. Anchors and Anchor Bolts:
1. Headed: ASTM F1554, Grade 36.
2. Unheaded and Standard Hex Head Bolts with Hex Nuts: ASTM A307.
3. Additional Anchors: As indicated on the Structural Drawings.

C. Fasteners:
1. Provide zinc-coated fasteners with galvanizing complying with ASTM A153 for exterior use or where built into exterior walls.
2. Select fasteners for type, grade, and class required for installation.

D. Washers:
1. Plain Washers: ANSI B18.22.1, Type A-W.
2. Plain Hardened Washers: ASTM F436.
3. Beveled Washers: IFI B18.23.1.
4. Exterior standard washers shall be plated.

E. Welding:
1. Electrodes for Welding: In accordance with AWS Code.
2. Welding Filler Metal for Carbon Steel: AWS A5.1 or A5.5 E70XX for SMAW welding process, AWS A5.18 ER70S-X for GMAW welding process, AWS A5.17 or A5.23 F7X-EXXX for SAW welding process, and AWS A5.20 E7XT-X for FCAW welding process.

F. Nonmetallic Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining shrinkage-compensating, and with at least 8,000-psi compressive strength at 28 days; MBT “Sonogrout 10K” by BASF Construction Chemicals, or equal conforming to ASTM C1107.

2.4 GALVANIZING

A. Galvanizing: Provide zinc coating for items exposed to exterior atmosphere, shown on the Drawings, or specified to be galvanized using the hot-dip process after fabrication in accordance with ASTM A385.
1. Comply with ASTM A153 for galvanizing of iron and steel hardware.
2. Comply with ASTM A123 for galvanizing of rolled, pressed, and forged-steel shapes, plates, bars, and strips 1/8 inch thick and heavier.

3. Comply with ASTM A123 for galvanizing of assembled steel products.
4. Safeguarding against warping and distortion during hot-dip galvanizing of metal fabrications shall be in conformance with ASTM A384.

B. Newly galvanized items shall not be water quenched or chromate quenched after galvanizing if they are scheduled to receive a paint coating.

C. Exterior standard bolts, cast-in-place anchor bolts, turnbuckles, clevises, and nuts shall be galvanized.

2.5 PROTECTIVE COATINGS

A. Products:
1. Galvanizing-Repair Paint: Minimum 95 percent zinc-dust-content in dried film paint for regalvanizing welds in galvanized steel[, complying with FS DOD-P-21035a]; "Z.R.C. Cold Galvanizing Compound" by ZRC Worldwide, "Cold Galv Primer" by Valspar, or equal. Where repaired galvanizing is to be left exposed, use repair paint that will closely match appearance of hot-dip galvanizing; "Galvilite" by ZRC Worldwide, or equal.
2. Shop Primer for Ferrous Metal - Not Galvanized:
   a. Interior: Modified alkyd; Tnemec Series "FD88 Azeron" or equal, 1.5 to 2.5 DFT.
   b. Exterior: Inorganic, zinc-rich: "Tneme-Zinc 90-97," or equal, 2.0 to 3.5 DFT.
3. Field-Applied Finish Paints: As specified in Section 09 90 00 Painting and Coating.

B. Galvanized Surfaces:
1. Repair zinc coating damaged after fabrication with specified repair paint in accordance with ASTM A780, AHDGA publication, "Recommended Practice for Touch-up of Damaged Galvanized Coatings," and manufacturer's recommendations for application of repair paint.
2. Zinc-coated surfaces to be painted shall be chemically treated and finished painted as specified in Section 09 90 00 Painting and Coating.

C. Shop Priming:
1. Shop-prime work, except stainless steel, surfaces to be epoxy painted, galvanized, or epoxy-coated, surfaces and anchors encased in concrete, surfaces to be grouted against, and surfaces and edges to be field welded, unless otherwise indicated.
2. Primer paint shall be compatible with required finish coat.
3. Surface Preparation Prior to Priming:
   a. Galvanized Surfaces: SSPC No. 1.
   b. Concealed Items: SSPC No. 2 or No. 3.
   c. Exposed Items: SSPC No. 6.
4. Apply primer within 8 hours of preparation of surface or sooner if necessary to prevent rusting.

5. Primer shall be applied to a minimum dry film thickness of 2 mils.
6. Paint application shall be in accordance with SSPC PA1, "Shop, Field, and Maintenance Painting."

D. Surfaces to be welded shall be protected from painting by use of masking. Inadvertent overspray on surfaces to be welded shall be removed by wire brushing.

E. Finish Painting: As specified in Section 09 90 00 Painting and Coating. Finish exposed fasteners to match adjacent metal.

F. Protective Coating Schedule: Confer with County's Representative for required coating at items not scheduled.
   1. Interior Items: Shop primed or galvanized as specified, and field finish painted with standard performance coating.
   2. Exterior and Rooftop Items: Galvanized and field finish painted with standard performance coating.

2.6 FABRICATED ITEMS

A. Interior Wall-Mounted Steel Ladders (If Used): Galvanized steel.
   1. Construct to comply with ANSI A14.3. Modify material sizes and dimensions if required to meet current code requirements.
   2. Clear Rung Width: 18 inches, unless otherwise shown.
   3. Side Rails: Flat bars, 3/8 inch x 2 inches, unless otherwise shown.
   4. Rungs:
      a. Size: 1-inch-diameter, slip-resistant rungs evenly spaced but not more than 12 inches on center.
      b. Rung to side rail connections shall be fillet welded all around with 5/16-inch fillet welds.
      c. Rungs shall be 7 inches from centerline of rungs to surfaces behind the ladder except provide clear 4-inch toe space to wall at elevator pit ladders.
   5. Standoff clips shall be evenly spaced but not more than 6 feet on center at each side rail.
   6. Top standoff clips shall be 6 inches below landing surface.
   7. Top rungs shall be flush with landing surface.
   8. Anchor stringers top and bottom.
   9. Side Rails Extensions:
      a. Extend 51 inches above landing surface with rungs at side-access ladders and 42 inches above landing surface without rungs at step-through ladders.
      b. Side rails shall extend 42-inches above sill of access door at elevator pits.]

B. Miscellaneous Framing and Supports:
   1. Provide miscellaneous steel framing and supports as required to complete the Work.

2. Fabricate to sizes, shapes, and profiles shown or required.
   a. Except as otherwise shown, fabricate from structural steel shapes, plates, and steel bars, of all-welded construction, using mitered corners, welded brackets and splice plates, and a minimum number of joints for field connection.
   b. Cut, drill, and tap units to receive items anchored to the Work.
3. Galvanize miscellaneous framing and supports wherever indicated and used in an exterior location.

2.7 MANUFACTURED ITEMS

A. Cast Abrasive Safety Strips and Nosings (If Used): Extruded aluminum with abrasive granules in epoxy binder.
   1. At Precast Terrazzo Treads: It is anticipated that safety strips will be integral with precast treads and landings. If metal safety strips are preferred, coordinate with County's Representative for type and color selection.
   2. At Concrete Treads: Type 24 by American Safety Tread Co. or equal.
   3. At Metal Stairs: "Spectra" Type WP2J by Wooster Products, equal by American Safety Tread Co., or equal.
   4. Colors to be selected by County's Representative from manufacturer's standard range.
   5. Top landing and bottom tread shall have contrasting color to meet handicap code.

2.8 FABRICATION - GENERAL REQUIREMENTS

A. Use materials of size and thicknesses shown or required to produce adequate strength and durability in finished product for intended use.

B. Work to dimensions shown on the Drawings or accepted on shop drawings within the allowable tolerances as defined in referenced AISC Code.

C. Use type of materials shown or specified for various items of work.

D. Castings shall be sound and free of warp, cracks, blowholes, or other defects that impair strength or appearance.

E. Form exposed work true to line and level with accurate angles and surfaces and straight, sharp edges. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Weld in accordance with recommendations of AWS.
   1. Welding shall be done in a sequence, which minimizes distortion and shrinkage.
   2. Electrodes preheat and welding process shall meet AWS prequalification requirements and the electrode manufacturer's written recommendations for specific applications.
   3. Headed concrete anchors and deformed bar anchors shall be shop welded in accordance with AWS C5.4 and AWS D1.1

G. Provide anchorage devices and fixings where necessary for securing metal fabrications to in-place construction, including threaded fasteners for concrete and masonry inserts, through bolts, lag bolts, and other connectors as required.

H. Fabricate and space anchoring devices as shown and required to provide adequate support for intended use of work.

I. Metal fabrications shall be fabricated completely in the shop except as otherwise specified or shown on the Drawings.

J. Sheared and flame cut edges shall be true to line and free from rough corners and projections.

K. Reentrant cuts/corners shall be filleted to a radius of not less than 1/2 inch.

L. Holes:
   1. Holes shall be punched, subpunched, and reamed, or drilled in accordance with referenced AISC Specifications. Holes shall not be made by flame cutting.
   2. Holes shall be 1/16 inch larger than the nominal bolt diameter, except holes for cast-in-place anchor bolts and inserts which shall be 3/16 inch larger than the nominal bolt diameter and as otherwise shown on the Drawings.
   3. Fabrication holes and notches not required, oversized, or slotted and not shown on the Drawings shall be subject to prior review by County's Representative.

M. Bent plate shall be in accordance with AISC minimum radius for bending.

N. Fabricated threads shall comply with ANSI B1.1 UNC-2A.

2.9 SOURCE QUALITY CONTROL

A. Metal fabrications shall be inspected after fabrication.

B. Inspection of welding shall be in accordance with AWS D1.1 and the special inspection requirements of the CBC with all welds visually inspected.
   1. Ultrasonic testing shall be in accordance with AWS D1.1.
   2. Magnetic particle testing shall be in accordance with ASTM E709.
   3. Dye penetrant testing shall be in accordance with ASTM E165.
   4. A minimum of 10 percent of indicated welds shall be tested.
   5. Acceptance of welding inspection results shall be in accordance AWS D1.1.

C. Inspection of headed concrete anchor and deformed bar anchor welding shall be in accordance with AWS D1.1 and the special inspection requirements of the CBC.

D. Hot-dip galvanizing shall be inspected after galvanizing in accordance with AHDGA "Inspection of Products Hot-Dip Galvanized after Fabrication."

E. Acceptance of blast cleaning inspection shall be in accordance with SSPC VIS-1, "Pictorial Surface Preparation Standards for Painting Steel Surfaces."

F. A minimum of 10 percent of headed concrete anchors and deformed bar anchors shall be tested in accordance with AWS D1.1.

PART 3 - EXECUTION

3.1 FIELD PREPARATION

A. At the time of connecting, bearing surfaces shall be free from loose or non-adherent rust, loose mill scale, oil, grease, dirt, mud, and any foreign matter, coating, or defect that adversely affects the connection.

B. Surface preparation for welding shall be in accordance AWS D1.1, except loose or non-adherent rust, loose mill scale, and paint shall be removed by wire brushing.

3.2 INSTALLATION

A. Install metal fabrications as shown on the Drawings in accordance with reviewed submittals and referenced standards including allowable tolerances as defined in the AISC "Code of Standard Practice for Steel Buildings and Bridges."

B. Cut, drill, and fit as required for installation.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete.

D. Set work accurately in location, alignment, and elevation; plumb, level, true, and free of rack; measured from established lines and levels.

E. Adjust items prior to securing in place so as to ensure proper matching of components and correct alignment.

F. Anchors and Fastening:
   1. Connections shall be as shown on the Drawings. Connections and splices not shown on the Drawings shall be subject to prior review by County's Representative.
   2. Anchor bolts shall be placed within the allowable tolerances as defined in the AISC Code of Standard Practice for Steel Buildings and Bridges.
   3. Cast-in-place miscellaneous metals and fasteners shall be installed and set by template prior to concrete placement.
   4. Concrete anchors shall be installed and tightened to proper torques using proper initial head clearances at expansion nut-type concrete anchors and with nuts initially flush with the end of the bolt at wedge and sleeve-type concrete anchors in accordance with the manufacturer's written instructions and specifications.

5. Resin/adhesive anchors shall be fully cured prior to use.
6. Connection parts in connections not slip joints shall be properly drawn together and the bolts tightened to the snugtight condition.
7. Bolts in slip-joint connections shall be provided with lock nuts and initially tightened to the snugtight condition, then backed off half turn.
8. Standard bolt heads and nuts at oversized and slotted holes shall be provided with plain washers.
9. High-strength bolt heads and nuts at oversized and slotted holes shall be provided with plain hardened washers.
10. Bolt heads and nuts at sloped surfaces shall be provided with beveled washers.

G. Holes that require enlarging to admit bolts shall be reamed. Holes shall not be enlarged by flame cutting.

H. Field Welding:
1. Comply with applicable AWS specification for procedures of manual shielded metal arc welding, for appearance and quality of welds, and for methods used in correcting welding work.
2. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
3. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.
4. Protect and clean areas surrounding welds.
5. Welding shall be done in a sequence, which minimizes distortion and shrinkage

I. Field correcting by flame cutting shall not be permitted without prior review by County's Representative.

J. Filler and/or shim plates shall be furnished and installed by the Contractor to provide alignment of members where required due to mill and/or fabrication tolerances.

3.3 FIELD QUALITY CONTROL

A. Metal fabrications and fasteners shall be inspected after installation.

B. Cast-in-place anchor bolts and miscellaneous metal fabrications shall be inspected after they have been placed and prior to concrete placement.

C. Wedge and expansion nut-type concrete anchor and resin/adhesive anchor installation shall be inspected in accordance with special inspection requirements of the CBC.

D. Inspection of welding shall be in accordance with AWS D1.1 the special inspection requirements of the CBC with all welds visually inspected. Acceptance of welding inspection results shall be in accordance with of AWS D1.1.
1. Ultrasonic testing shall be in accordance with AWS D1.1.
2. Magnetic particle testing shall be in accordance with ASTM E709.

3. Dye penetrant testing shall be in accordance with ASTM E165.
4. A minimum of 10 percent of indicated welds shall be tested.
5. Acceptance of welding inspection results shall be in accordance AWS D1.1.

E. A minimum of 10 percent of slip-joint connections shall be inspected.

F. A minimum of 10 percent of all concrete anchor connections shall be tested using a calibrated torque wrench in accordance with the ICC-ES Report.

3.4 ADJUSTMENT AND TOUCH-UP

A. Inspect installed work. Correct deficiencies.

B. Immediately after erection, touch up abraded areas of shop paint, and paint all exposed areas with same material as used for shop painting.
1. Apply by brush or spray.
2. Touch up galvanized surfaces as specified.

C. Restore finishes damaged during installation and construction period so that no evidence of correction work remains.

D. Wet storage stains on galvanized steel shall be removed after installation.

3.5 PROTECTION

A. Protect finishes of metal fabrications from damage during construction period as required.

END OF SECTION 05 50 00

SECTION 05 70 00

DECORATIVE METAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Interior entry structure with stainless steel cladding, infill panels, and laminated glass ceiling.
2. Railings and guardrails at stairs, landings, platforms, lofts, balconies, mezzanines, and floor openings.
   a. Includes wall-mounted handrails.
   b. Includes structural glass guardrail at windows in Loft area.
   c. Cable rail components, including cap end turnbuckles and fixed cap ends.
   d. Includes re-installation of salvaged historic wood and bronze railing, and new railing to match existing.
3. Metal framing for multi-wall plastic panels and translucent resin panel system.
4. Custom decorative ironwork fencing.
5. Additional custom ornamental iron and metal work, both interior and exterior, as shown on the Drawings.
6. Shop-applied finishes.

B. Related Requirements:
1. Metal Fabrications: Section 05 50 00; embedded steel supports for decorative metal work.
2. Decorative Metal Stairs: Section 05 71 00.
3. Interior Architectural Woodwork: Section 06 40 23;
   a. Wood components integral with decorative metal items.
   b. Metal laminate.
4. All-Glass Entrances: Section 08 42 26; doors at entry structure.
5. Door Hardware: Section 08 71 00; hardware for gates at entry structure.
6. Glazing: Section 08 80 00;
   a. Glass integral with decorative metal.
   b. Multi-wall plastic panels.
   c. Translucent resin panel system.
7. Acoustical Wall and Ceiling Finishes: Section 09 83 10; perforated metal panels.
8. Painting and Coating: Section 09 90 00; field-applied coatings.
9. Electrical: Division 26; light fixtures and electrical work in connection with decorative metal.
10. Electronic Safety and Security: Division 28.
11. Product and Finish Schedule: Sheet A7.0.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.

B. Coordination:
   1. Coordinate installation of anchorages. Furnish setting drawings, diagrams, templates, and directions for installing anchorages, including sleeves, inserts, anchor bolts, and items with integral anchors, to be embedded in concrete.
   2. Coordinate sequence of installation with Sections whose work adjoins decorative metalwork.

C. Pre-installation Meeting: Prior to installation of selected decorative metal items, Contractor, County's Representative, representative of metal fabricator, installer, and others whose work interfaces with decorative metal work or may affect its quality shall meet at the Project site to coordinate related requirements.
   1. Notify participants at least 5 working days before conducting meeting.
   2. Review material selections and procedures to be followed in performing the work.
   3. Review in detail job conditions, schedule, construction sequence, installation requirements, and quality of completed installation.
   4. Review in detail the means of protecting completed work during remainder of construction period.
   5. Record discussions of meeting and any conflict, incompatibility or inadequacy. Furnish a copy of record to each participant.

D. In addition, attendance is required at pre-installation meetings specified in other Sections whose work interfaces with work of this Section.

1.3 ACTION SUBMITTALS

A. Shop Drawings:
   1. Large-scale drawings for fabrication and erection of assemblies not completely shown by manufacturer's product data.
      a. Include, as appropriate, plans, elevations, complete details, thicknesses, sizes, types, grades, classes of metal, connecting and joining methods, anchorages.
      b. Show required field measurements and interface with work of other Sections.
      c. Welds, both shop and field, shall be indicated by AWS "Symbols for Welding, Brazing and Nondestructive Examination," A2.4.
      d. Indicate all required field measurements.
   2. Setting drawings, templates, instructions, and directions for installation of anchorage devices.
   3. Coordinate with shop drawing requirements of other Sections whose work adjoins decorative metalwork.

4. Provide shop drawings for mockups specified below.

B. Product Data: Manufacturer's specifications and installation instructions for manufactured products to be used in the fabrication of work, including paint products, cabling components, fence components, bolts, tie rod ends, and other exposed hardware.

C. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 4:
         1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
         2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
         3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
      b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

D. Samples:
   1. Exposed metals in selected finishes, 12 inches x 6 inches, or 12 inches long as applicable.
   2. Each type of railing assembly, showing specified rail profile. These samples, if accepted, may be installed as mockups and as part of finished construction.
   3. Each type of exposed fastener or hardware.
   4. Full-size samples of castings and forgings.
   5. For products involving selection of color, texture, or design including mechanical finishes.
   6. For custom castings, submit finished samples showing ability to reproduce detail, cast-metal color, and quality of finish. Samples may be of similar previous work.
   7. Sample of fencing, showing finish.
   8. Additional samples as requested by the County's Representative.

1.4 INFORMATIONAL SUBMITTALS

A. Qualifications as specified.

B. Report on pre-installation meeting.

C. Welding:
   1. Statement of qualifications for fabricator, installer, and welders.
   2. Completed "Procedure Qualification Record" (PQR) and "Welding Procedures Specification" (WPS) forms for the welds to be performed under this Section.

D. Delegated-Design Services: Engineering data for railings and guardrails.
   1. Calculations verifying compliance with structural design criteria by design engineer and showing reactions to structure.
   2. Drawings shall be signed by design engineer, or certification that structural portion of drawings are in compliance with design calculations shall be submitted.
   3. Although all calculations shall be submitted, only reactions to structure are subject to review.

E. Certification: Submittal drawings and engineering data shall be signed by design engineer, or certification that structural portion of drawings are in compliance with design calculations shall be submitted.

F. Galvanizing: Proposed methods of cleaning and profiling surfaces. Include methods for each decorative item.

G. Documentation verifying that glass for guardrail assembly and for laminated glass ceiling meets requirements specified in this Section and in Section 08 80 00 Glazing.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Design engineer shall be a structural or civil engineer registered in the State of California.
   2. Fabricator/Installer: Documented experience in fabrication and installation of decorative metal similar to that indicated for this Project, and with a record of successful in-service performance.
   3. Welders: Certified and qualified in accordance with procedures specified in American Welding Society Standard in accordance with AWS D1.1, using procedures, materials, and equipment of the type required for the work.

B. Welding procedures and operations shall comply with AWS B2.1, "Standard for Welding Procedure and Performance Qualifications." Comply with AWS publication "Welding Zinc Coated Steel" for galvanized products.

C. Mockups:
   1. Provide a full-size mockup of each type of railing assembly for review and approval by County's Representative:
   2. In addition, first installed example of each type or configuration of decorative metal, and each installation condition, if not illustrated by above mockups, shall serve as a mockup for review and approval by County's Representative of workmanship, visual effect, match with similar existing work (where applicable), and interface with adjacent construction.
   3. Each mockup shall consist of a typical assembly in specified finish, complete with mounting devices, and shall be sufficiently large and complete to demonstrate installation and aesthetic effect of completed assembly.
   4. If requested by County's Representative, install mockup as directed.
   5. If requested, make modifications to mockups without additional charge to County.
   6. Do not proceed with remainder of installation until mockups have been approved.
   7. Where appropriate and acceptable to County's Representative, approved mockups may become part of the completed Work.

1.6 FIELD CONDITIONS

A. Field Measurements: Where decorative metal is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on shop drawings.
   1. Allow for trimming and fitting wherever taking of field measurements before fabrication might delay work.
   2. Coordinate fabrication schedule with construction progress so as to avoid construction delays.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions, and proceed with fabricating decorative metal without field measurements. Coordinate with other construction to ensure that actual dimensions correspond to established dimensions.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect steel from corrosion.

B. Store packaged materials in original unbroken package or container.

C. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE REQUIREMENTS

A. Decorative steel shall be considered Architecturally Exposed Steel (referred to as "AES" or "AESS") and shall conform to the recommended practices of the Architectural Products Division (AMP) of the National Association of Architectural Metal Manufacturers (NAAMM), Section 10 of the AISC Code of Standard Practice, and the additional requirements of this Section.

B. Structural Performance of Railing Assemblies, Handrails, and Guardrails:
   1. General:
      a. In engineering stainless steel railing components to withstand structural loads indicated, determine allowable design working stresses of railing materials based on 60 percent of minimum yield strength.
      b. Glass: 25 percent of mean modulus of rupture (50 percent probability of breakage), as listed in "Mechanical Properties" in AAMA's Aluminum Curtain Wall Series CW-12, "Structural Properties of Glass."
   2. Handrails and Top Rails of Guards:
      a. Uniform load of 50 lb/ft applied in any direction.
      b. Concentrated load of 200 lb applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.
   3. Infill of Guards:
      a. Concentrated load of 50 lb applied horizontally on an area of 1 square foot.
      b. Infill load and other loads need not be assumed to act concurrently.

C. Industry Standards:
   1. Comply with "Metal Rail Manual" of National Ornamental and Miscellaneous Metals Association (NOMMA).
   2. Comply with "Pipe Railing Manual" of National Association of Architectural Metal Manufacturers (NAAMM).

D. Regulatory Requirements:
   1. Comply with the Americans with Disabilities Act (ADA).
   2. Comply with the CBC.

E. If modifications to designs indicated are proposed in order to meet code requirements, indicate them as such on shop drawing submittals. Work with County's Representative to arrive at an acceptable design that is sufficiently similar to the design indicated.

F. Design interface and connections to existing work in such a way as to minimize damage and defacement to existing construction. Give particular attention to historic items.

G. Recycled-content Materials:
   1. Steel fabrications shall contain a minimum of 60 percent recycled content by weight, calculated by adding the post-consumer recycled content percentage to one-half of the pre-consumer recycled content percentage.
   2. Aluminum fabrications shall contain a minimum of 25 percent recycled content by weight, calculated by adding the post-consumer recycled content percentage to one-half of the pre-consumer recycled content percentage.

H. Regional Materials: If available, furnish materials extracted, processed, and manufactured within 500 miles of Project.

2.2 METAL MATERIALS

A. General: Metal surfaces exposed to view shall not exhibit pitting, seam marks, roller marks, splice marks, mill identification markings, stains, discolorations, or other blemishes and imperfections.

B. Steel: Provide steel and iron, in form indicated, to comply with the following requirements:
   1. Plate, Shapes, and Bars: ASTM A36.
   2. Sheet: Commercial-quality, cold-rolled, stretcher-leveled, carbon-steel sheet complying with ASTM A1008, Class I, matte finish.
   3. Tubing: Cold formed, ASTM A500.
   4. Pipe: ASTM A53, Grade B, Schedule 40.
   5. Gray-Iron Castings: ASTM A48, Class 30.
   6. Malleable-Iron Castings: ASTM A47, grade as recommended by fabricator for type of use indicated.
   7. Wrought Iron: Low carbon alloy (less than 0.035 percent), malleable iron with good tensile strength and suitable for shaping and hammering as required by fabricator for use indicated.

C. Galvanized-Steel Sheet: Commercial Quality, ASTM A653.
   1. Coating Designation: G90.
   2. Thickness: As required by SMACNA for specific conditions and as indicated.

D. Stainless Steel:
   1. Alloy: Type 304 at interior, Type 316 at exterior, unless otherwise indicated or specified.
   2. Sheet and Plate: ASTM A167 or A240.
   3. Bars: ASTM A276.
   4. Tubing for Railings and Guardrails: ASTM A554.
   5. Finish: American Iron and Steel Institute (AISI) No. 4, satin directional brushed, unless otherwise noted.

E. Bronze:
   1. Extrusions: ASTM B455, Copper Development Association (CDA) Alloy 385 (Architectural Bronze).

2. Solid Fittings: Color matching casting alloy; CDA Alloy 865 meeting ASTM B584 for sand castings.
3. Sheet and Plate: As selected by fabricator; alloys suitable for fabrication and use of each item and for finish specified.
4. Finish: To match similar existing work.

F. Brass: CDA Alloy 260.
1. Rods: ASTM B16.
2. Sheets and Strip: ASTM B36, minimum 18 gage, #8 finish.
3. Tube: ASTM B135, minimum 18 gage, #8 finish.
4. Color match of sheets, moldings, and tubes shall be maintained.

2.3 ADDITIONAL MATERIALS

A. Resilient Pads: Closed-cell neoprene complying with ASTM C864, in black color.

B. Anchor Bolts: ASTM A307, nonheaded type, unless otherwise indicated.

C. Fasteners: Use fasteners of same basic metal as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
1. Fasteners for Exterior Steel Items:
   a. Use stainless steel for fasteners up to 1/2 inch in diameter, unless otherwise shown.
   b. Use hot-dip galvanized fasteners for fasteners over 1/2 inch in diameter, unless otherwise shown.
2. Provide concealed fasteners for interconnecting decorative metal components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method. Exposed fasteners shall be indicated on required submittals.
3. Provide turnbuckles, sleeves, spacers, and other hardware items as indicated.
4. Provide anchorage devices and fasteners where necessary for securing decorative metal to in-place construction.

D. Wood Components Associated with Decorative Metalwork: As shown and conforming to requirements specified in Section 06 40 23 Interior Architectural Woodwork.

E. Metal Laminate: As specified in Section 06 40 23 Interior Architectural Woodwork.

F. Glass and Translucent Plastic: As shown and conforming to requirements specified in Section 08 80 00 Glazing.

G. Perforated Metal Wall Panels: As specified in Section 09 83 10 Acoustical Wall and Ceiling Finishes.

H. Welding Electrodes and Filler Metal: Type and alloy of filler metal and electrodes as recommended by producer of metal to be welded, complying with applicable AWS specifications, and as required for color match, strength, and compatibility in fabricated items.

I. Nonshrink Grout: As specified in Section 05 50 00 Metal Fabrications.

J. Adhesive, Stainless Steel to Other Materials: Epoxy resin type, unless otherwise recommended by metal manufacturer and fabricator.

K. Infill Panels and Additional Items: As shown on the Drawings and as listed in Product and Finish Schedule on Sheet A7.0.

2.4 DECORATIVE METAL FABRICATIONS AND COMPONENTS

A. Structural Glass Railing System: Pre-engineered, component based system by Livers Bronze Co., C. R. Laurence, or Julius Blum & Company, Inc. Products and system specified to establish required level of appearance, quality, and performance are by C. R. Lawrence.
   1. Base (Shoe Molding): CRL Mill Aluminum 120-inch BSS Standard GRS Square Base Show drilled with 9/16-inch hole for 1/2 inch minimum glass.
      a. Size: 2-1/2 inches by 4 inches designed to accommodate 1/2 inch thick glass.
      b. Mounting: As shown.
   2. Top Rail: Aluminum, as selected by County's Representative.
   3. Glass: 1/2-inch thick, clear laminated float complying with ANSI Z97.1 and additional requirements for glass and safety glazing specified in Section 08 80 00, "Glazing."
   4. Gaskets, Tapes, Setting Blocks, Sealant, Anchors, and Other Accessories: As provided and recommended by guardrail manufacturer.

B. Handrail Brackets:
   1. Stainless Steel: C. R. Laurence, Julius Blum & Company, Inc., or equal.
   2. Steel Railing: Builders Brass No. 253 at stud walls, No. 258 at concrete or masonry walls, finish 613 (US10B), or equal.
   3. Bronze Railing: #803 by Julius Blum & Company or equal.

C. Cable Rail Components: Stainless steel; "I-SYS" cable system by Carl Stahl-DécorCable Innovations, 800-444-6271; Jakob Rope Systems, 866-215-1421; Feeney Wire Rope, Inc., Oakland, CA, 800-888-2418; or equal.
   1. Cable: 6 mm (1/4 inch), 1-x-19 aircraft cable made from stranded wire; ASTM A492, Type 316.
   2. Fittings: Stainless steel connectors sized for required wire with capability to sustain without failure a load equal to the minimum breaking strength of the cable with which they are used.
      a. Use minimum profile terminal studs on each end of cable.

b. Provide “Sleekline Cap End Turnbuckle” and “Fixed Cap End” by Feeney, Inc., or equal, in size and configuration to fit cable, as shown on the Drawings.
c. Provide with washers, accessories, and installation tools as recommended by manufacturer.

3. Rubber Grommets: Provide at supports.

D. Canopy Panel Suspension Components: Stainless steel rods with threaded ends, as shown on the Drawings. Provide tubular turnbuckles, bolts, screw eyes, and other components as shown or as required for a complete installation.

E. Custom Fence: As shown on the Drawings.

F. Manufactured Picket Fence (If Required): "Estate A" by Monumental Iron Works or equal.
1. Pickets: 3/4 x 3/4 inch, 16 gauge, with pointed picket tops, spaced as shown.
2. Horizontal Rails: 1-1/2 x 1-1/2 inch, 14-gage tube steel.
3. Posts: 2 x 2 inches, 11-gage tube steel, located as shown.
4. Factory Finish: Black powder coat.

2.5 FABRICATION METHODS - GENERAL

A. Form decorative metal to required shapes and sizes, with true lines and angles. Provide components in sizes and profiles indicated.

B. Use special care so as to avoid bending, twisting, or otherwise distorting individual members.

C. Castings shall be sound and free of warp, cracks, blowholes, or other defects that impair strength or appearance. Grind, wire-brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks.

D. Provide rebates, lugs, and brackets as required to assemble units and to attach to other work. Drill and tap for required fasteners, unless otherwise indicated. Use concealed fasteners, unless otherwise indicated on reviewed shop drawings.

E. Joints and Connections:
1. Shop-assemble items to greatest extent possible so as to minimize field splicing and assembly. Disassemble only as necessary for shipping and handling limitations. Clearly mark items for reassembly and coordinated installation.
2. Use connections that maintain structural value of joined pieces.
3. Detail connections to facilitate fabrication and erection in accordance with the referenced AISC code.
4. Mill joints to a tight, hairline fit. Cope or miter corner joints. Form joints exposed to weather so as to exclude water penetration.

5. Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction, including threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts, lag bolts, and other connectors as required.
6. Fabricate and space anchoring devices as shown and required to provide adequate support for intended use.

F. Welding and Brazing: Comply with AWS-recommended practices.
1. Welds shall be continuous.
2. Weld and braze behind finished surfaces without distorting or discoloring exposed side.
3. Remove flux from exposed welded and brazed joints. Dress exposed and contact surfaces.

G. Finishing:
1. Finish exposed surfaces to smooth, sharp, well-defined lines and arris.
2. Welds, burrs, roller marks, seams, and rough surfaces shall be ground neat and smooth.
3. Mill markings shall be completely removed.
4. Gouges, dents, and other surface abuse shall be filled and ground smooth.
5. Stainless Steel: Use electrochemical or mechanical methods or abrasive cleaners to remove weld discoloration on exposed surfaces. Welded area shall match appearance of adjacent surface after cleaning.

2.6 GALVANIZING

A. Removal soluble salts as specified in Section 09 90 00 Painting and Coating prior any surface preparation.

B. Surface Preparation Prior to Galvanizing: In accordance with SSPC Specification SP-10, "Near White Blast Cleaning."

C. Provide zinc coating for items exposed to exterior atmosphere, shown on the Drawings, or specified to be galvanized using the hot-dip process after fabrication.
1. Comply with ASTM A153 for galvanizing of iron and steel hardware.
2. Comply with ASTM A123 for galvanizing of assembled steel products and rolled, pressed, and forged-steel shapes, plates, bars, and strips 1/8 inch thick and heavier.

D. Newly galvanized items shall not be water quenched or chromate quenched after galvanizing if they are scheduled to receive a paint coating.

2.7 PROTECTIVE PAINT COATINGS

A. General:
   1. Comply with manufacturer's preparation and application instructions for each coating and NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Manufacturer's instructions shall govern in event of conflict.
   2. Coatings shall be shop-applied to the greatest extent possible, including galvanized items, except surfaces and edges to be field welded.
      a. Acrylic coating systems specified for galvanized steel products and specified in Section 09 90 00 Painting and Coating may be totally shop-applied, have primer applied in shop with topcoats applied in field, or be totally field-applied at Contractor's option. Specified waterborne epoxy primer is UV stable and may be left exposed in field prior to application of finish coats.
      b. Interior non-galvanized steel shall be shop-primed and either shop or field finish painted.
      c. High performance PVDF coatings shall be shop applied except for specified field-applied system.
   3. Corrosion Control: Prevent galvanic action and other forms of corrosion by insulating metals from direct contact with incompatible materials.
   4. Steel members shall be protected and be free of corrosion when ready to receive field-applied finish coatings. Apply coatings before rusting occurs.
   5. Metal shall be degreased.
   6. Finish Painting: Where not shop finished, field finish painting shall conform to requirements specified in Section 09 90 00 Painting and Coating.
   7. Finish exposed fasteners to match adjacent metal.

B. Products:
   1. Shop Primers and Finish Paints: As specified under each coating system.
   2. Galvanizing-Repair Paint: Minimum 82 percent zinc-dust-content paint for re-galvanizing welds in galvanized steel, complying with FS DOD-P-21035a; "Z.R.C. Cold Galvanizing Compound" by ZRC Worldwide, "Cold Galv Primer" by Valspar, or equal. Where repaired galvanizing is to be left exposed, use repair paint that will closely match appearance of hot-dip galvanizing; "Galvilite" by ZRC Worldwide, or equal.
   3. Field-Applied Finish Paints: As specified in Section 09 90 00 Painting and Coating.

C. Repair galvanized coating damaged after fabrication during handling, installation, or welding. Use specified repair paint in accordance with ASTM A780, AGA publication, "Recommended Practice for Touch-up of Damaged Galvanized Coatings," and manufacturer's recommendations for application of repair paint.

D. Surface Preparation - General:
   1. All Metals: Removal soluble salts as specified in Section 09 90 00 Painting and Coating prior to other surface preparation.

2. Non-Galvanized Steel: SSPC-SP No. 6/NCACE No. 3 "Commercial Blast Cleaning."
3. Galvanized Steel: As specified.
4. Aluminum: In accordance with procedures required by the coating manufacturer.
5. Stainless Steel: Acid etch.
6. Comply with any additional procedures required by the coating manufacturer.

E. Surface Preparation - Galvanized Surfaces:
1. General: Surfaces shall be cleaned and profiled prior to receiving applied coatings in accordance with ASTM D6386 or ASTM D7396 for sheet products.
   a. Methods shall be selected based on age of galvanized coating, condition of surface and intended paint coating.
   b. High spots and rough edges shall be smoothed out.
   c. Care shall be taken not to damage the zinc coating.
   d. Do not use phosphate treatment on galvanized surfaces scheduled to receive zinc-rich primers.
2. Cleaning: Surface shall be prepared in accordance with SSPC SP-1 with specified cleaner and followed by application of pre-paint conditioner.
3. Profiling: After cleaning, surfaces shall be profiled by abrasive sweep or brush blasting to smooth surface.
   a. Blast material particle size for profiling galvanized steel should range between 8 to 20 mils (200 to 500 microns).
   b. The blast profile on the galvanized surface should be less than 2.0 mils and more than 1.0 mils.
4. Comply with the additional recommendations included in the AGA document "Duplex Systems: Painting over Hot Dip Galvanized Steel," and ASTM D6386.
5. Comply with any additional procedures required by the coating manufacturer.

F. Shop-prime work, except surfaces and edges to be field welded, unless otherwise indicated.
1. Surface Preparation: As specified.
2. Apply air-dried primer after cleaning and pretreatment, to provide a minimum dry film thickness.
3. Apply primer within 8 hours of preparation of surface or sooner if necessary to prevent rusting.
4. Primer paint shall be compatible with required finish coat.

G. System INT 5.1A - Standard Performance Acrylic Coating - Interior:
1. Surface Preparation prior to Priming: As specified.
2. Shop Primer: Modified alkyd; Tnemec Series "FD88 Azeron" or equal.
3. Finish: Standard performance acrylic as scheduled under System INT 5.1A in Section 09 9000 Painting and Coating.

H. System EXT 5.3M-5 - Premium-Performance Acrylic Coating on Exterior Steel, Galvanized:
   1. Coating Manufacturer: Products specified to establish required level of performance, quality and appearance are by Tnemec.
   2. Surface Preparation: As specified.
   3. Primer: Modified polyamidoamine epoxy as specified in Section 09 90 00 Painting and Coating.
   4. Topcoat: Water-based, high dispersion acrylic as specified in Section 09 90 00 Painting and Coating.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install decorative metalwork and related materials as shown on the Drawings in accordance with reviewed submittals and referenced standards.

B. Cut, drill, and fit as required for installation.

C. Set work accurately in location, alignment, and elevation; plumb, level, and true; and free of rack; measured from established lines and levels.

D. Adjust items prior to securing in place so as to ensure proper matching of components and correct alignment.

E. Where glazing channel is recessed into floor or ceiling, install firmly and securely in accordance with reviewed submittals, and to match accepted mockups.

F. Field Welding:
   1. Comply with applicable AWS specification for procedures of manual shielded metal arc welding, for appearance and quality of welds and for methods used in correcting welding work.
   2. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
   3. Grind exposed welded joints smooth, unless otherwise specified, and restore finish to match finish of adjacent surfaces.

G. Erection Tolerances:
   1. Variation from Level: Maximum 1/4 inch in any column to column space or 20-foot run, noncumulative.
   2. Offsets in End-to-End or Edge-to-Edge Alignment of Consecutive Members: 1/16 inch.

3.2 RAILING INSTALLATION

A. Cope neatly to fit.

B. Secure posts and rails to metal with welded or bolted connections and to concrete and masonry with expansion bolts.
   1. Longitudinal members shall be parallel to each other, to floor surface, or to slope of stairs as shown.
   2. Center line of members within each railing run shall be in same vertical plane.

C. Secure wall railing brackets to stud wall construction with bolts into steel backing plates welded to studs.
   1. Space brackets maximum 60 inches on center and 9 inches from end of rails.
   2. Return rails to walls at ends.

D. Protect against galvanic action wherever dissimilar metals are in contact, using zinc-chromate primer on contact surfaces.

E. Adjust railings prior to securing in place to ensure proper matching at butting joints and correct alignment throughout their length. Plumb posts in each direction. Remove any burrs or protrusions that might snag fingers or clothing, and grind and polish smooth.

3.3 ADJUSTMENT AND TOUCH-UP

A. Inspect installed work, with particular attention to handrails. Correct deficiencies.

B. Immediately after erection, touch up abraded areas of shop paint, and paint all exposed areas with same material as used for shop painting.
   1. Apply by brush or spray.
   2. Touch-up shall not be noticeable.

C. Restore finishes damaged during installation and construction period so that no evidence of correction work remains.

D. Return items that cannot be refinished in the field to the shop. Make required alterations and refinish entire unit, or provide new units.

3.4 PROTECTION

A. Protect finishes of decorative metal from damage during construction period as required.

END OF SECTION 05 70 00

SECTION 05 71 00

DECORATIVE METAL STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Architectural metal stairs, shop primed.
2. Precast terrazzo for treads, risers, and landings.

B. Related Requirements:
1. Decorative Metal: Section 05 70 00; railings related to architectural metal stairs, including wall railings.
2. Painting and Coating: Section 09 90 00.
3. Product and Finish Schedule: Sheet A7.0.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.

1.3 ACTION SUBMITTALS

A. Shop Drawings:
1. Submit for fabrication of metal stairs. Show complete details, thicknesses, sizes, types, grades, classes of metal, finishes, connecting and joining methods, reinforcement, anchorage, and installation.
2. Dimensioned layout, anchorage, profiles, and details for precast terrazzo.

B. Product Data:
1. Specifications and installation recommendations as applicable.
2. Load tables and calculations verifying structural requirements.
3. Manufacturer's literature for shop-applied paint products, precast products, and other components where necessary to explain construction.

C. Sustainable Design (LEED):
1. General:
a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
b. Sustainable design submittals are in addition to other submittals.

c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.

2. The following information shall be provided:
   a. Credit MR 4:
      1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
      2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
      3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
   b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

D. Samples: Typical precast tread in selected profile and color, including warning striping, at least 6 inches long.

1.4 INFORMATIONAL SUBMITTALS

A. Engineering Data: Calculations for stairs by engineer in responsible charge verifying compliance with structural design criteria.
   1. Drawings shall be sealed and signed by engineer, or certification that structural portion of drawings are in compliance with structural design calculations shall be submitted.
   2. Although all structural calculations shall be submitted, only reactions to structure are subject to review. Design engineer shall seal and sign the structural calculations.

B. Certification for each welder.

C. Verification that precast terrazzo treads and flooring meet specified requirements for slip-resistance if not included in manufacturer's product data.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with the Americans with Disabilities Act (ADA).
   2. Comply with the CBC, including requirements for tread striping and slip resistance where applicable.
   3. In case of discrepancy between codes, or between code and specified requirements, the more rigorous requirement shall govern.

B. Design engineer shall be a structural or civil engineer registered in the State of California.

C. Stairs shall be fabricated by skilled mechanics and shall conform to the recommended practices of the National Association of Architectural Metal Manufacturers (NAAMM) and as listed below:
   1. American Hot-Dip Galvanizer's Association (AHDGA): Standard Specification.
   2. American Welding Society (AWS): Standard Code for Welding in Building Construction, as modified by the American Institute of Steel Construction, "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings."

D. Welders' Qualifications: Welding shall be performed by certified welders qualified in accordance with procedures specified in American Welding Society (AWS) Standard in accordance with AWS D1.1 using procedures, materials, and equipment of the type required for the work.

E. Mockup: First installed run of stairs, to include at least two adjacent precast terrazzo treads and an area of precast terrazzo landing, and complete with railing assembly, shall serve as a mockup for review by County's Representative of workmanship, visual effect, slip resistance, and interface with adjacent construction.
   1. Coordinate with other Sections as required for a complete mockup.

1.6 FIELD MEASUREMENTS

A. Field verify conditions affecting stairs. Obtain accurate dimensions for incorporation in shop drawings submitted before fabrication.

B. Verify dimensions before fabrication to ensure proper coordination and fit.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Shop-assemble stairs and railings to the greatest extent possible so as to minimize field splicing and assembly of units at the Project site.

B. Disassemble units only to the extent necessary for shipping and handling limitations.

C. Clearly mark units for reassembly and coordinated installation.

D. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE REQUIREMENTS

A. Architectural metal stairs shall conform for Architecturally Exposed Structural Steel (AESS) included in Section 10 of the American Institute of Steel Construction (AISC) Code of Standard Practice and the additional requirements for "Architectural Class" metal stairs of the "Metal Stairs Manual" published by the Architectural Metal Products Division (AMP) of the National Association of Architectural Metal Manufacturers (NAAMM).

B. Structural Performance of Stairs, Landings, and Platforms:
   1. Stairs, landings, and platforms shall support a minimum uniform live load of 100 psf. Individual stair treads shall support a 300-pound concentrated load placed in a position which would cause maximum stress.
   2. No anchorage of stair system to building structural system will be allowed except at floor landings. See Structural Drawings for anchorage at landings.
      a. Vertical load transmission will be allowed only at these points.
      b. Support rods from beams will not be permitted.

C. Design interface and connections to existing work in such a way as to minimize damage and defacement to existing construction.

D. Slip Resistance: Terrazzo treads and flooring, after application of specified finishes, shall maintain a minimum wet DCOF AcuTest value of 0.42 in accordance with ANSI A137.1-2012. Alternative testing to verify compliance, including wet and dry static coefficient value of 0.60 for level surfaces as defined by ASTM D2047 when determined by testing identical products in accordance National Floor Safety Institute (NFSI) recommendations, shall be acceptable to governing authorities.

E. Recycled-content Materials: Steel fabrications shall contain a minimum of 60 percent recycled content by weight, calculated by adding the post-consumer recycled content percentage to one-half of the pre-consumer recycled content percentage.

F. Regional Materials: If available, furnish materials extracted, processed, and manufactured within 500 miles of Project.

2.2 METAL MATERIALS

A. Steel Shapes, Bars, and Plates: ASTM A36.

B. Steel Plates to Be Bent or Cold Formed: ASTM A283, Grade C.

C. Pipe: ASTM A53, Grade A, extra strong.
   1. ASTM A120, if no bending required.
   2. Pipe Fittings: Malleable iron ASTM A47, grade 32510.

D. Steel Bars and Bar-Size Shapes: ASTM A663, Grade 65, or ASTM A36.

E. Cold-Drawn Steel Tubing: ASTM A500, Grade B.

F. Hot-Rolled Carbon-Steel Bars: ASTM A575, grade as selected by fabricator.

G. Steel Castings: ASTM A27, Grade 65-35, medium-strength carbon steel.

2.3 PRECAST EPOXY TERRAZZO

A. Precast Epoxy Terrazzo; Basis of Design: "Tectura Designs" by Wausau.
   1. Profile, Pattern, and Color Mix: As listed in Product and Finish Schedule on Sheet A7.0.
   2. Provide abrasive striping as required by code, stainless steel, in color and design selected by County's Representative from manufacturer's standards.

2.4 ACCESSORIES

A. Electrodes for Welding: In accordance with AWS Code.

B. Nonshrink Grout: ASTM C1107; nonmetallic, nonstaining, nongaseous, premixed grout with at least 8,000-psi compressive strength at 28 days; Sonneborn-Contech "Sonogrout," Upco "Upcon," or equal. Provide grout specifically recommended by manufacturer for interior and exterior applications.

C. Anchors: Threaded, wedge, or slotted type concrete inserts, hot-dip galvanized; Hilti, or equal.
   1. Provide lead expansion shields for machine screws and bolts.
   2. Provide bolt-anchor expansion shields for lag bolts.

D. Fasteners:
   1. General:
      a. Provide zinc-coated fasteners with galvanizing complying with ASTM A153 where built into floor systems.
      b. Select fasteners for the type, grade, and class required for the installation of steel stair items.
   2. Standard Bolts and Nuts: Regular hexagon-head type, complying with ASTM A307, Grade A.
   3. Lag Bolts: Square-head type.
   4. Machine Screws: Cadmium-plated steel.
   5. Wood Screws: Flathead carbon steel.
   6. Plain Washers: Round, general-assembly-grade carbon steel.
   7. Lock Washers: Helical-spring-type carbon steel.

2.5 FABRICATION

A. General:
   1. Form to shape and size with sharp lines, angles, and arrises.
   2. Shearing and punching shall leave clean, true lines and surfaces.
   3. Thickness of metal and details of metal, assembly, and support shall give ample strength and stiffness for the intended purpose.
   4. Provide lugs, clips, anchors, and miscellaneous fastenings necessary for complete assembly and installation.
   5. Miter corners and angles of exposed moldings and frames.

B. Joints and Fastenings:
   1. Conceal fastenings where practicable.
   2. Locate joints symmetrically.
   3. Fit adjacent pieces with hairline joints and aligned surfaces.

C. Stairs:
   1. Construct stairs as shop-made subassemblies. Except as otherwise shown on the Drawings, use structural steel plate stringers and formed-steel sheet treads and risers. Use all-welded construction.
   2. Fabricate treads and risers of 12-gage sheet or heavier, reinforced as necessary.
   3. Stringers shall have closed ends. Grind smooth for proper fit to headers.
   4. Form each tread and riser subassembly from one piece of steel.
   5. Provide angle cleats at stringers in order to support and align treads and risers.
   6. Provide necessary anchors, bolts, angles, hangers, supports, and other accessories for complete assembly and installation.
   7. Stairs shall have a toe plate forming a curbing, at all open edges of platforms and at all open ends and open back edges of treads.

2.6 PROTECTIVE COATINGS

A. Clean ferrous metal, and apply protective coating as specified in Section 09 90 00 Painting and Coating.

B. Angles Built into Concrete and Masonry: Coat with asphalt paint.

C. Anchors and Sleeves Built into Concrete and Masonry: Galvanize in accordance with ASTM A153.

D. Galvanizing: Provide zinc coating for items exposed to exterior atmosphere and other items shown on the Drawings or specified to be galvanized. Where practicable, use hot-dip process after fabrication.
   1. Comply with ASTM A153 for galvanizing of iron and steel hardware.
   2. Comply with ASTM A123 for galvanizing of rolled, pressed, and forged-steel shapes, plates, bars, and strips 1/8 inch thick and heavier.
   3. Comply with ASTM A386 for galvanizing of assembled steel products.

E. Where zinc-coated surfaces are specified to be shop primed and finish painted, chemically treat the surfaces to provide bond for paint, then apply primer and finish coat of paint.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install stairs and precast terrazzo as shown on the Drawings in accordance with reviewed submittals and referenced standards, to match accepted mockup.

B. Grout frames, plates, sills, bolts, and similar items set in concrete with nonshrink grout.

C. Cut, drill, and fit as required for installation.

D. Set work accurately in location, alignment, and elevation; plumb, level, and true; and free of rack; measured from established lines and levels.

E. Adjust items prior to securing in place so as to ensure proper matching of components and correct alignment.

F. Field Welding:
   1. Comply with applicable AWS specification for procedures of manual shielded metal arc welding, for appearance and quality of welds, and for methods used in correcting welding work.
   2. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
   3. Grind exposed welded joints smooth, unless otherwise specified, and restore finish to match finish of adjacent surfaces.

G. Bolted and Screwed Connections:
   1. Provide holes and connections for work of other Sections.
   2. Use bolts for field connections only.
      a. Draw nuts tight. Nick threads of permanent connections.
      b. Use beveled washer where bearing is on sloped surfaces.
   3. Where screws must be used for permanent connections, use countersunk flathead type. Space exposed screws evenly and symmetrically.

3.2 ADJUSTING

A. Inspect installed work. Correct deficiencies.

B. Restore finishes damaged during installation and construction period so that no evidence of correction work remains.
   1. Touch up abraded areas of shop paint, and paint all exposed areas with same material used for shop painting.
      a. Apply by brush or spray.
      b. Touch-up shall not be noticeable after final field finishing.

C. Return items that cannot be refinished in the field to the shop. Make required alterations and refinish entire unit, or provide new units.

D. Verify that slip-resistant warning strips are installed as required by code.

3.3 PAINTING AND PROTECTION

A. If protective wrappings have been provided for any stair components, maintain them until work is ready for final painting.

B. Field paint as specified in Section 09 90 00 Painting and Coating.

3.4 CLEANING

A. After installation and adjusting, clean stairs and railings to remove dirt, stains, soil, marks, and other foreign matter from surfaces.

B. Remove protective wrappings when work is no longer subject to construction damage.

END OF SECTION 05 71 00

SECTION 06 10 53

MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exposed plywood backing for utilities.
   2. Miscellaneous blocking, backing, and nailers.
   3. Wood treatments.

B. Related Requirements:
   1. Gypsum Sheathing: Section 06 16 43.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
   3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

1.3 ACTION SUBMITTALS

A. Product Data: Wood treatment certification and instructions for proper use of each type of treated material.

B. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 6:
         1) List of each FSC certified wood product on a line-item basis and noted as to whether each wood product is FSC Pure, FSC Mixed Credit, or FSC Mixed Percentage.
         2) List of each wood product used on the project on a line item basis.
         3) Vendor's invoices showing vendor's FSC Chain of Custody number.

4) Cut sheets for the FSC wood materials used on the project.

b. Credit MR 7: Certificates of chain-of-custody signed by millwork manufacturer certifying that wood products were obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria."
   1) Include evidence that millwork manufacturer is certified for chain-of-custody by an FSC-accredited certification body.
   2) Include statement indicating costs for each certified wood product.

c. Credit EQ 4.1: Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for field-applied adhesives and sealers used inside of the weatherproofing barrier of the building demonstrating compliance with SCAQMD Rule #1168.

d. Credit EQ 4.4: Composite wood and agrifiber materials manufacturers' product data stating that they contain no added urea-formaldehyde resins.
   1) Include statement indicating costs for each product.

C. Samples of treated lumber, if requested by County's Representative.

1.4 QUALITY ASSURANCE

A. Lumber-grading rules and wood species shall conform to Product Standard PS 20 and "Standard Grading and Dressing Rules No. 16" of the West Coast Lumber Inspection Bureau (WCLIB).

B. Plywood shall conform to requirements of Product Standard PS 1.

C. Rough carpentry shall conform to applicable requirements of local building code and CBC, Chapter 25, unless otherwise noted.

D. Grade Marks:
   1. Identify lumber and plywood by official grademark, or provide inspection certificates from appropriate grading and inspecting agencies.
   2. Do not expose faces with grademarks.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Immediately upon delivery to jobsite, place materials in area protected from weather.

B. Protect lumber stored on site from rain and excessive sun. Stack in such fashion as to prevent twisting and warping.

C. Comply with additional requirements specified in Section 01 43 00 Quality Assurance – Materials and Equipment and Section 01 65 00 Delivery, Storage and Handling.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

A. Certified Wood: Lumber and plywood shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

2.2 MATERIALS

A. Lumber:
   1. Dimensions:
      a. Specified lumber dimensions are nominal.
      b. Actual dimensions shall conform to industry standards established by the National Grading Rule Committee.
   2. Moisture Content: Provide S-Dry seasoned lumber at time of permanent closing in of building for all framing, except, for lumber of 4 inch or greater nominal thickness, provide FOHC lumber.
   3. Dressing: Lumber shall be dressed S4S, unless otherwise noted.
   4. Species: Unless otherwise noted, framing lumber shall be Douglas Fir.
   5. Grades: Following lumbers are specified in accordance with WCLIB grade designations.
      a. Backing and Furring: 2 inches to 4 inches thick x 2 inches to 4 inches wide, "Standard" or better grade, paragraph 122-b.

B. Plywood: Group 1 species complying with US Product Standard PS 1.
   1. Veneer Grade at Exposed Utility Backing: B-D or B-C Exterior or Interior with exterior glue, five plies for 1/2 inch and thicker.

C. Rough Hardware:
   1. Screws for attaching wood members and plywood to metal stud walls, partitions and furring shall be Type S self-drilling, self-tapping, anodized steel drywall screws of required lengths as specified in Section 09 29 00, "Gypsum Board."
   2. Hot-dip-galvanize items exposed to moisture or weather.

D. Gypsum Sheathing: As specified in Section 06 16 43, “Gypsum Sheathing.”

2.3 WOOD TREATMENTS

A. Wood-Preservative Pressure Treatment: In accordance with AWPA U1 and T1 Standards. Treat wood sills, sleepers, blocking, furring, stripping, and similar members in contact with concrete, built-up roofing, waterproofing, and flashing. Use system specifically formulated for either interior or exterior applicable to location of use.

B. Fire-Retardant Pressure Treatment:
   1. Fire-retardant-treated wood shall have an Underwriters' Laboratories stamp signifying a FR-S rating certifying a 25 or less flame-spread and smoke-developed value when tested in accordance with ASTM E84.
   2. Acceptable Fire-Retardant Pressure Treatment: "Dricon" by Lonza Wood Protection, or equal.
   3. After treatment, kiln-dry lumber to maximum 15 percent moisture content.
   4. Locations of Use:
      a. All concealed lumber, and plywood except as otherwise specified, shall be fire retardant treated.
      b. Exposed back boards for electrical and telephone panels and other equipment shall be fire retardant treated.
   5. Where fire retardant treated wood is exposed to weather, it shall be identified as "Exterior" to indicate there is no increase in the listed flame spread index as defined in CBC Section 2303.2 when subjected to ASTM D2898.
   6. Where fire retardant treated wood is exposed to humid interior conditions, it shall be identified as "Interior" to indicate that the treated wood has a moisture content of not over 28 percent when tested in accordance with ASTM D3201 procedures at 92 percent relative humidity.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
   1. Work shall be accurately cut and solidly fitted together so as to provide strong, rigid joints, with full bearing for all members.
   2. Surfaces shall be level, plumb, and true.
   3. Provide accessories and install in accordance with manufacturer's specifications.

B. Blocking:
   1. Provide and install wood blocking, plywood backing, furring strips, or grounds detailed or required to provide anchorage for finishes, accessories, fixtures, and similar items required to complete work.
   2. Blocking and/or backing shall be securely bolted or otherwise anchored in place.

C. Plywood: Comply with recommendations of the APA for fabrication and installation of plywood work.
   1. Lay with face grain perpendicular to supports.
   2. Butt panel ends and edges to a close but not tight fit (allow 1/16-inch space).

3.2 FIELD APPLIED TREATMENTS

A. Fire-Retardant; Concealed Interior Wood and Plywood: Brush or spray-apply two coats of intumescent paint. Take care to prevent paint from showing on work to remain exposed.

B. Appearance of finished work shall match accepted sample.

END OF SECTION 06 10 53

SECTION 06 16 43

GYPSUM SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Non-structural gypsum wall sheathing.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.

1.3 ACTION SUBMITTALS

A. Product Data: Manufacturer's product data for wall sheathing.

B. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 4:
         1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
         2) Statement or vendor’s invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
         3) Cut sheets or manufacturer’s technical data sheet indicating levels of recycled content for each material having recycled content.
      b. Credit MR 5:
         1) Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Non-Structural Gypsum Wall Sheathing: Fiberglass-faced, silicone-impregnated core, complying with ASTM C1177.
   1. Thickness: 5/8 inch.
   2. Size: 4 feet wide x maximum lengths possible; 8 feet minimum.
   3. Edge: Square.
   4. Manufacturers and Products: "Securerock" by United States Gypsum, "Dens Glass" by Georgia Pacific, or equal.

2.2 ACCESSORIES

A. Fasteners:
   1. Corrosion-resistant conforming to ASTM C954 and requirements of CBC Section 1403.3.
   2. Length as recommended by manufacturer for board thickness and substrate.
   3. Provide Type specifically designed for attachment to wood framing.

PART 3 - EXECUTION

3.1 INSTALLATION – NON-STRUCTURAL WALL SHEATHING

A. Install sheathing vertically or horizontally using specified fasteners in accordance with board manufacturer's installation recommendations.

B. Fit boards tightly against each other and around openings.
   1. If applied vertically, edges shall be parallel to and centered over studs.
   2. Stagger end joints.

C. Provide back blocking or supplemental framing where recommended by board manufacturer and wherever end joints do not bear against framing.

D. Secure to supports with specified fasteners in accordance with manufacturer's recommended spacing, but not more than 4 inches on center around perimeter at edge and end supports and 8 inches on center at intermediate supports.
   1. Install flush with face of board; do not countersink.
   2. Keep perimeter fasteners 3/8 inch from edges and ends of board units.

END OF SECTION 06 16 43

SECTION 06 40 23

INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Cutting and re-working of existing walnut veneer paneling at First Floor.
2. Cutting and re-working of existing wood handrails, and new wood handrails to match existing.
3. Solid stock hardwood trim.
4. Handrail brackets and other finish hardware for interior millwork.
5. Other miscellaneous millwork items as indicated.

B. Related Requirements:
1. Metal Fabrications: Section 05 50 00; metal supports for millwork items.
2. Decorative Metal: Section 05 70 00; metal railings and balustrade.
3. Architectural Wood Casework: Section 06 41 00.
4. Decorative Plastic Paneling: Section 06 64 00; plastic paneling and column cladding.
5. Wood Doors: Section 08 14 00.
6. Painting and Coating: Section 09 90 00; field-applied finishes.

1.2 DEFINITIONS

A. Except as otherwise specified or noted on the Drawings, exposed, semi-exposed, and concealed surfaces shall be as defined in the "North American Architectural Woodwork Standards (NAAWS)" published jointly by WI and AWMAC (hereinafter also referred to as the "woodworking standard").

1.3 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.

B. Coordination: Provide blocking and backing for handrails brackets and other finish items as required. Coordinate with Section 09 22 16 Non-Structural Metal Framing and Section 06 10 53 Miscellaneous Rough Carpentry.

1.4 ACTION SUBMITTALS

A. Shop Drawings:
   1. Submit for all custom fabricated items and millwork profiles not included as part of shop drawings submitted under other Sections.
   2. Include to-scale, dimensioned profiles identifying materials used and indicating method of attachment.
   3. Prepare in accordance with the NAAWS Section 1 Article entitled "Submittals."
   4. First page of shop drawings and each elevation shall bear the WI Certification label.

B. Product Data:
   1. Data for manufactured products and shop-applied coatings.
   2. Medium Density Fiberboard (MDF).

C. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. LEED design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with specified LEED requirements.
   2. The following information shall be provided:
      a. Credit MR 4:
         1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
         2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
         3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
      b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.
      c. Credit MR 6:
         1) List of each FSC certified wood product on a line-item basis and noted as to whether each wood product is FSC Pure, FSC Mixed Credit, or FSC Mixed Percentage.
         2) List of each wood product used on the project on a line item basis.
         3) Vendor's invoices showing vendor's FSC Chain of Custody number.
         4) Cut sheets for the FSC wood materials used on the project.

d. Credit MR 7: Certificates of chain-of-custody signed by millwork manufacturer certifying that wood products were obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria."
   1) Include evidence that millwork manufacturer is certified for chain-of-custody by an FSC-accredited certification body.
   2) Include statement indicating costs for each certified wood product.

e. Credit EQ 4.1:
   1) Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for field-applied adhesives and sealers used inside of the weatherproofing barrier of the building demonstrating compliance with SCAQMD Rule #1168.
   2) Manufacturer's product data for aerosol adhesives used inside of the weatherproofing barrier of the building, including printed statement of VOC content that demonstrates compliance with the limits defined in Green Seal Standard GS-36.

f. Credit EQ 4.4: Composite wood and agrifiber materials manufacturers' product data stating that they contain no added urea-formaldehyde resins.
   1) Include statement indicating costs for each product.

D. Samples:
   1. Millwork:
      a. 12-inch lengths of each profile for each required wood species, Grade and finish.
      b. 12-inch square for each panel product.
      c. Apply specified finish to samples applied in step fashion showing unfinished surface and each applied coating.
   2. Typical handrail bracket and other hardware as requested by County's Representative.

1.5 INFORMATIONAL SUBMITTALS

A. Fabricator qualifications.

1.6 QUALITY ASSURANCE

A. Standard for Materials and Workmanship: Comply with applicable requirements of the referenced NAAWS publication (hereinafter referred to as "woodworking standard"). Where Contract Documents indicate requirements that conflict with or augment the woodworking standard, comply with the conflicting or augmenting requirements.

B. Fabricator Qualifications: Fabricators not active members of WI will be considered for approval by the County's Representative upon submission of verifiable evidence of experience in successful completion of work similar to work of this Project.

C. Mockups:
   1. First installed area or example of each type or configuration of millwork, and each installation condition, shall serve as a mockup for review and approval by County's Representative of workmanship, visual effect, and interface with adjacent construction.
   2. Accepted mockups may remain as part of the work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver products until ambient conditions required can be and are maintained.

B. Do not deliver millwork until wet work, painting, grinding, and similar operations in storage and installation areas that could damage, soil, or deteriorate millwork have been completed.

C. Store products only in areas where ambient conditions required can be and are maintained.

D. Comply with additional requirements specified in Section 01 43 00 Quality Assurance – Materials and Equipment and Section 01 65 00 Delivery, Storage and Handling.

1.8 FIELD CONDITIONS

A. Ambient Conditions: During and after installation, maintain the same temperature and humidity conditions in building spaces as will occur after occupancy.

B. Before fabricating, obtain field measurements, and verify that dimensions are as indicated on the shop drawings.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. Sustainable Design:
   1. At least 90 percent of interior wood trim and shelving shall be formaldehyde free.
   2. Hardwood lumber and veneers for millwork shall be harvested from "certified" sustainably managed forest sources. Documentation of each source of hardwood lumber shall be submitted for review prior to fabrication. Lumber and veneers for which acceptable documentation is not submitted may be rejected.
      a. "Sustainably managed" shall mean, in addition to other considerations, forests that are being managed through a professionally administered forestry management plan in which timber growth equals or exceeds harvesting rates in both quality and quantity.

b. Acceptable certifiers shall be the Smart Wood program administered by the Rainforest Alliance, 212-677-1900, the Forest Conservation program administered by Scientific Certification Systems, 510-832-1415, or a Forest Stewardship Council (FSC) accredited equivalent.

2.2 WOOD MATERIALS

A. General:
1. Moisture Content at Time of Fabrication: As specified in woodworking standard.
2. Provide wood dressed on all exposed faces.
3. Do not use twisted, warped, bowed, or otherwise defective wood.
4. Sizes indicated on Drawings are net actual size, unless otherwise indicated.
5. Do not mark or color material, except where such marking will be concealed in finish work.
6. Wood is not required to be fire-retardant treated.
7. Lumber shall be free of sapwood, knots, pitch, or resin.

B. Softwood Lumber Trim for Opaque Finish (Painted):
1. Species and Grade: Douglas fir-larch or Douglas fir south
2. Grade: Superior or C & Btr finish in accordance with NLGA, WCLIB, or WWPA or NAAWS Custom, whichever is more restrictive.
3. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
4. Finger Jointing: Allowed only where shown on the Drawings or approved in writing by County's Representative.
5. Face Surface: Surfaced (smooth).

C. Hardwood Lumber Trim for Transparent Finish (Stain or Clear):
1. Species: To match similar existing work.
2. Color, Graining, Finish, and General Appearance: To match similar existing work and accepted mockup.
3. Matching: Selected for compatible grain and color.
4. Other Veneer and Trim: As shown or scheduled on the Drawings.

D. Moldings for Opaque Finish (Painted Finish): Poplar.
1. Grade: WMMPA HWM 2, "P" or NAAWS Custom, whichever is more restrictive.
2. Maximum Moisture Content: 9 percent.
3. Patterns: Custom, as shown.
4. Finger Jointing: Allowed only where shown on the Drawings or approved in writing by County's Representative.

2.3 PANEL MATERIALS

A. Fire-Rated Panels:
   1. Medium-Density Fiberboard (MDF): Premium Grade, ANSI A208.2, manufactured from moisture-resistant formaldehyde free resin, 3/4-inch thick; "Pyroblock MDF Plus" by Panel Source International, 780-458-1007, or equal.
      a. MDF shall be post treated and certified as fire-retardant with flame-spread rating of 25 or less and smoke-developed rating of 200 or less in accordance with ASTM E84.
      b. Panel shall be verified by Contractor as compatible with laminating processes and adhesives used by panel fabricator for adhering panel facings.
   2. Premium Grade, fire-retardant treated, formaldehyde free particleboard conforming to ANSI A208.1, Grade M2, will be considered by only if MDF is determined by Contractor as not suitable to be coated, clad, or veneered as specified. Documentation verifying non-suitability shall be submitted to County's Representative for review.

B. Medium-Density Fiberboard (MDF): ANSI A208.2, formaldehyde free; "Medite II" by SierraPine, Ltd, Roseville, CA, or equal.
   1. Density: 48 lb/ft^3.
   2. Type: Grade 155.
   3. Thickness: 3/4 inch, unless otherwise shown or required to meet NAAWS performance requirements.

C. Hardwood Plywood: Conform to ANSI/HPMA, Type II.
   1. Face Veneer Species: Any closed-grain hardwood listed in the referenced woodworking standard.
   2. Cut: Rotary.
   3. HPMA Grade: C, intended for opaque finish.

2.4 ADDITIONAL MATERIALS

A. Handrail Brackets: Satin-finish, cast aluminum; Trimco 3406, or equal.

B. Clothes Pole and Support Brackets:
   1. Rail (Clothes Pole): Type 304 stainless steel, 1-1/16-inch diameter, in manufacturer's standard lengths cut to sizes shown; EPCO #870 or equal.
   2. Rail Supports: Stainless steel, round, 1-1/16 inch cuff flange; EPCO #855-SS or equal.

C. Metal Laminate: Chemetal or equal, in color and finish as scheduled.

2.5 ACCESSORIES

A. Adhesives: VOC compliant, water and mold resistant of type, grade, and class best suited for the intended use, compatible with laminating methods of fabricator, substrate, wood or metal type.

B. Concealed Fastening for Paneling: Clip system of size and type to suit application as indicated and as recommended by panel fabricator; "Panelclip" by Brooklyn Hardware or equal.

C. Rough Hardware: Furnish items required to complete the Work.

D. Manufactured Aluminum Trim for Existing Paneling: 1-1/2 inch x 4 inch aluminum tube frame, as selected by County's Representative.

2.6 FABRICATION

A. General:
1. Conform to NAAWS Premium Grade requirements, unless otherwise specified.
2. Mill from solid stock to profiles indicated on the Drawings.
3. Provide in maximum possible lengths so as to minimize joints.
4. When necessary to cut and fit on site, provide materials with ample allowance for cutting.

B. Standing and Running Trim:
1. Opaque Finish:
   a. Species: Poplar.
   b. Surfacing: S4S.
2. Transparent Finish: Species, color, graining, and general appearance to match similar existing work. Comply with NAAWS Premium Grade requirements.
3. Size and Profiles: As shown.
4. Provide in maximum possible lengths so as to minimize joints.

C. Wall-Mounted Handrail (If Used):
1. Species: Hardwood, conforming with NAAWS Premium Grade requirements.
2. Finish: Transparent.

D. Frames:
1. Species: Specified softwood unless otherwise shown.
2. Mill from solid stock to profiles indicated on the Drawings. No splices will be permitted.

E. Closet Shelves:
1. Fabricated to required lengths based on field measurements.
2. Provide hook strip (cleats) 3/4 inch by minimum 3-1/2 inches, continuous three sides (ends and back), to receive metal pole brackets.
3. Maximum free span of shelving shall be 30 inches.
4. Finish: Opaque.

2.7 FINISHING

A. General:
   1. Prepare for finishing and apply coatings in accordance with NAAWS Custom Grade (for opaque coatings) and Premium Grade (for transparent coatings) requirements of NAAWS Section 5 and to conform to appearance and finish of County's Representative's control samples and accepted mockups.
   2. Field application of coatings shall be VOC compliant and conform to Section 09 90 00 Painting and Coating with coatings meeting the South Coast Air Quality Management District (SQAQMD) Rule 1113, Architectural Coatings, rules in effect on June 3, 2011.

B. Back Painting: Surfaces which are not exposed to view at any time shall be primed. Prime end grain edges at both exposed and butt joints prior to installation.

C. Contractor's Option: Apply transparent finish in shop, in accordance with NAAWS factory finishing requirements as specified in Section 5 of the NAAWS Standards, using finish system to match similar existing work.

D. Field-applied coatings shall conform to Section 09 90 00 Painting and Coating.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical and building items affecting woodwork are placed and ready to receive work.

3.2 PREPARATION

A. Condition millwork to humidity and temperature in installation area prior to installing.

B. Complete work specified in this Section to whatever extent not completed at factory or prior to installation.

3.3 INSTALLATION - GENERAL

A. Install work plumb, true, and in accordance with the Drawings and referenced NAAWS Standard.

B. Accurately scribe work abutting other components with maximum gaps of 1/16 inch.

C. Fastening: Secure with finishing nails or screws as required. Where other anchorage is indicated, use appropriate rough hardware.
   1. Set all finished nails for putty stopping.

2. Hammer, tool marks, and marred surfaces and edges are not acceptable on exposed surfaces.
3. At exposed wood to receive transparent finish, use concealed fasteners wherever possible. Where not possible, use countersunk fasteners with plugs to match adjoining wood.

D. After installation, wipe finished surfaces in order to remove marks of handling and to prepare for finishing, if not previously shop-finished, as specified in Section 09 90 00 Painting and Coating.

E. Field Finishing: Apply in accordance with Section 09 90 00 Painting and Coating.

3.4 INSTALLATION AND REWORKING OF PANELING

A. Existing walnut veneer in the high First Floor space will have large areas of paneling removed, coordinated with reveal lines in the panel layout.
1. It is intended that each of the new openings be precisely cut to leave the wall's solid reveal material intact.
2. Surround each opening with aluminum tube frame as shown.
3. As the reveal line is approximately 14 inches high, this will result in a curb at the openings, with a new sill on top of the cut studs. Sill shall match paneling.
4. Paneling removed at openings may be used for other woodwork as required.

B. Install, align, and adjust support system in accordance with manufacturer's recommendations.

C. Anchorage shall be acceptable for Project seismic requirements.

D. Install panels as indicated on reviewed submittals, to match accepted mockup. Verify alignment, and adjust as necessary.

E. When alignment and adjustment is complete, mechanically fasten system in place.
1. Install paneling level, plumb, true, and straight with no distortions.
2. Shim as required with concealed shims.

F. Installation Tolerances: Comply with NAAWS standards for Custom Grade, and as follows. In case of discrepancy, the more rigorous requirements shall govern.
1. Install level and plumb to a tolerance of 1/16 inch in 96 inches.
2. Install with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.
3. Install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/16 inch.

3.5 ADJUSTING AND CLEANING

A. Adjust moving or operating parts to function smoothly and correctly.

B. After installation, wipe finished surfaces to remove marks of handling, and leave in clean condition.

C. All damaged, stained, scratched, or otherwise disfigured portions of the work shall be touched up, refinished, or replaced to satisfaction of the County's Representative.

END OF SECTION 06 40 23

SECTION 06 41 00

ARCHITECTURAL WOOD CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Custom casework with bamboo veneer facing.
2. Electric conduit and junction boxes concealed within casework.
3. Preparation of casework for utilities.
4. Installation of casework lighting fixtures.
5. Finish hardware for casework.

B. Related Requirements:
1. Interior Architectural Woodwork: Section 06 40 23.
2. Joint Sealants: Section 07 92 00.
3. Resilient Flooring: Section 09 65 00; resilient base at cabinets.
4. Plastic Laminate Countertops: Section 12 36 23.
5. Solid Surfacing Countertops: Section 12 36 61.
6. Electrical: Division 26; connection of casework power lines to building service, including any adapters for electrical work at Project site; lamps for lighting fixtures.
7. Product and Finish Schedule: Sheet A7.0.

1.2 DEFINITIONS

A. Except as otherwise specified or noted on the Drawings, exposed, semi-exposed, and concealed surfaces shall be as defined in the "North American Architectural Woodwork Standards (NAAWS)" published jointly by WI and AWMAC (hereinafter also referred to as the "woodworking standard").

1.3 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.

B. Coordinate the work with plumbing and electrical rough-in.

1.4 ACTION SUBMITTALS

A. Shop Drawings: Drawn to scale dimensioned plans, elevations, component profiles, and large scale details for each casework item.
   1. Indicate materials, assembly methods, joint details, fastening methods, accessory listings, location of hardware, and schedule of finishes for each casework item.
   2. Show mechanical, electrical, and building items in and adjacent to casework.
   3. Show locations and types of blocking and other anchors to be built into substrates.
   4. Prepare in accordance with NAAWS, Section 1, “Submittals.”

B. Product Data:
   1. Cabinet hardware items.
   2. Veneers and laminates.
   3. Shop-applied coatings.
   4. Include manufacturer's literature for items which are proposed for use and specified herein only by listing the intended performance requirements.

C. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 4:
         1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
         2) Statement or vendor’s invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
         3) Cut sheets or manufacturer’s technical data sheet indicating levels of recycled content for each material having recycled content.
      b. Credit MR 5:
         1) Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.
      c. Credit MR 6:
         1) List of each FSC certified wood product on a line-item basis and noted as to whether each wood product is FSC Pure, FSC Mixed Credit, or FSC Mixed Percentage.
         2) List of each wood product used on the project on a line item basis.
         3) Vendor’s invoices showing vendor’s FSC Chain of Custody number.
         4) Cut sheets for the FSC wood materials used on the project.

d. Credit MR 7: Certificates of chain-of-custody signed by millwork manufacturer certifying that wood and bamboo products were obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria."
   1) Include evidence that millwork manufacturer is certified for chain-of-custody by an FSC-accredited certification body.
   2) Include statement indicating costs for each certified wood product.

e. Credit EQ 4.1: Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for field-applied adhesives and sealers used inside of the weatherproofing barrier of the building demonstrating compliance with SCAQMD Rule #1168.

f. Credit EQ 4.4: Composite wood and agrifiber materials manufacturers' product data stating that they contain no added urea-formaldehyde resins.
   1) Include statement indicating costs for each product.

D. Samples:
   1. Bamboo Veneer: Samples selected from and representative of veneer to be used; 16-inch-x-24-inch pieces, complete with specified finish.
   2. Solid Stock: 16-inch long with stepped finish.
   3. PVC edge material.
   4. Thermoset decorative panels.
   5. Hardware: Items as requested by County's Representative.

1.5 INFORMATIONAL SUBMITTALS

A. Certification: Before delivery of casework to jobsite, submit AWI Quality Certification Program certificates.

B. Fabricator qualifications.

1.6 QUALITY ASSURANCE

A. Standard for Materials and Workmanship: Comply with applicable requirements of the NAAWS (referred to as the "woodworking standard"). Where Contract Documents Show requirements that conflict with or augment the woodworking standard, comply with the most stringent requirements.

B. Fabricator Qualifications: Firm specializing in quality architectural cabinetwork and active member of WI or AWI. Fabricators not active members of WI or AWI will be considered upon submission of verifiable evidence of experience in successful completion of work similar to work of this Project.

C. Casework of this Section shall be fabricated by a single firm.

D. Wood and bamboo under this Section do not need to be pressure- and or fire-retardant treated.

E. Mockups: First installed example of casework, complete with countertops, sinks, and hardware, shall serve as a mockup for review by County's Representative of workmanship, visual effect, and interface with adjacent construction. Coordinate with other Sections for a complete mockup.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver products until ambient conditions required can be and are maintained at site storage areas.

B. Do not deliver casework until wet work, painting, grinding, and similar operations in storage and installation areas which could damage, soil, or deteriorate casework have been completed.

C. Protect casework during transit, delivery, storage, and handling to prevent damage, soiling, and deterioration.

D. Comply with additional requirements specified in Section 01 43 00 Quality Assurance – Materials and Equipment and Section 01 65 00 Delivery, Storage and Handling.

1.8 PROJECT CONDITIONS

A. Ambient Conditions:
   1. Maintain temperature and humidity in storage and installation areas as required to maintain moisture content of installed casework within a 1 percent tolerance as determined by fabricator. Maintain required conditions from date of delivery through remainder of construction period.
   2. During and after installation, maintain the same temperature and humidity conditions in building spaces as will occur after occupancy.

B. Obtain field measurements and verify dimensions are as indicated on shop drawings before fabricating casework.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

A. Sustainable Design Requirements:
   1. Panel products shall be free of urea formaldehyde.
   2. Sustainably Sourced Materials and Products.
   3. Low-Emitting Materials: Adhesives and sealants shall meet or exceed the South Coast Air Quality Management District Rule 1168 VOC Requirements.
   4. Manage construction waste in accordance with provisions of Section 01 35 13.26 Construction and Demolition Waste Management.

2.2 WOOD MATERIALS

A. Wood and Bamboo Veneer:
   1. General: Veneers shall conform to WI Premium Grade.
   2. Species: Bamboo to match samples provided by County's Representative.

B. Solid Stock:
   1. Concealed: Species and grade as specified in woodworking standard for casework construction, unless otherwise indicated.
   2. Exposed solid stock shall be Premium Grade to match adjacent wood or bamboo veneer in species, color, graining, and general appearance.
   3. Moisture content at time of fabrication: As specified in woodworking standard.
   4. Provide wood dressed on all exposed faces, unless otherwise indicated.
   5. Do not use twisted, warped, bowed, or otherwise defective wood.
   6. Sizes indicated are nominal, unless otherwise indicated.
   7. Do not mark or color wood, except where such marking will be concealed in finish work.

C. Subbase Framing for Floor Mounted Casework: 2 by pressure treated Douglas fir and as specified in Section 06 10 53 Miscellaneous Rough Carpentry.

D. Wood Blocking: As specified in Section 06 10 53 Miscellaneous Rough Carpentry.

2.3 PANEL MATERIALS

A. Plywood: Types, grades, and cores as specified in the woodworking standard, except as otherwise specified.

B. Particle Board: Not permitted.

C. Medium-Density Fiberboard (MDF): ANSI A208.2, formaldehyde free.
   1. Basis of Design Products; "Medite II," 3/4 inch thick, by SierraPine Composite Solutions, Roseville, CA, "AllGreen Premium MDF" by The CanFibre Group, Ltd., or equal.
   2. See requirements for edge painting in Section 09 90 00 Painting and Coating.

D. Hardboard: Tempered Grade, conforming to standards of American Hardboard Association or PS-50; use smooth side exposed.

E. Thermally-Fused Melamine Panels (TFM): Melamine resin-impregnated decorative paper thermally fused to a formaldehyde free particle board or MDF core.
   1. Color: White.
   2. Use:
      a. Inside of drawers.
      b. Adjustable shelving at Shallow Base Cabinets.
      c. Where indicated on the Drawings.

2.4 LAMINATE MATERIALS

A. High-Pressure Plastic Laminate: Conforming to NEMA LD3.1 and ISO 4586-2.

B. Grades:
   1. Horizontal Surfaces, If Applicable: ISO 10/HGS; horizontal, general purpose, standard. Provide Grade 12/HGP, horizontal, general purpose.
   2. Vertical Surfaces, If Applicable: ISO 20/VG; vertical, general purpose.
   3. Cabinet Liner: ISO 20/VG; vertical, general purpose.

C. Manufacturers, Colors, and Patterns: As selected by County's Representative from manufacturers' standards. Selections may include all solid colors and matte-finish plastic laminates.

2.5 HARDWARE

A. Comply with requirements of BHMA A156.9, Type 2 (Institutional).

B. Finishes:
   1. Exposed Items: Satin stainless steel, 630 complying with ANSI/BHMA A156.18.
   2. Concealed Items: Manufacturer's standard finish, complying with applicable product class of ANSI/BHMA A156.9.

C. Hinges: Provide two per door up to 36 inches high, three per door over 36 inches high.
   1. Totally Concealed, Free Swinging:
      a. Basis of Design Product; Häfele #329.06.602 or 611 or equal.
   2. Butt Hinges: Five knuckle, institutional, wrap-around hinges exceeding ANSI/BHMA 156.9 Grade 1 requirements.
      a. Basis of Design Product; "Rockford Process Control" (RPC)
      b. Material: Type 304 stainless steel,
      c. Height: 2-1/2 inches.
      d. Do not "let-in" hinges into door.

D. Drawer Slides: Provide two per drawer.
   1. Basis of Design Manufacturers: Accuride, Knape & Vogt, or equal.
   2. Full depth of drawers; quiet type with nylon ball-bearing rollers; positive pull-out stop.
   3. Type: Side mounted, lift out, full extension.
   4. Capacity, per Pair:
      a. Pencil Drawers: 50 pounds.
      b. Box Drawers: 75 pounds.
      c. File Drawers: 100 pounds.
   5. In addition to capacity, slides shall be sized in accordance with manufacturer's recommendations for drawer width.

E. Pulls: Unless otherwise indicated, provide one for each door or drawer, two for each drawer 30 inches or wider. Mount in direction indicated.
   1. Basis of Design Product; 8-13/16 inch Steel Bar Pull p01015 by Liberty Hardware, or equal by Häfele, Stanley, EPCO, or equal.

F. Shelf Supports:
   1. End Supported - Brackets:
      a. Shelf-Support Clips: Basis of Design Product; Knape & Vogt No. 256 NP or equal.
      b. Shelf Standards: Basis of Design Product; Knape & Vogt No. 255 NP or equal.

G. Locks: Not required.

H. Grommets: Plastic.
   1. Basis of Design Manufacturer; Doug Mockett & Co. Inc., Manhattan Beach, CA, or equal.
   2. Type: SG Series.
   3. Provide EPP Series where required to accommodate computer plugs.
   4. Color: To be selected by County's Representative.

I. Base Levelers: Adjustable plastic foot and base for screwing into bottom of cabinet; of design selected by fabricator for casework design, flooring, and conditions of installation. Provide with extensions as required.
   1. Basis of Design Manufacturers; Hardware Concepts, Inc., Häfele, or equal.

J. Toekick Clip: Zinc-plated steel with plastic side piece
   1. Basis of Design Product; Häfele #637.31.984 or equal.

K. Hardware shall be installed by casework fabricator.

2.6 ADDITIONAL MATERIALS

A. Glass: Types as indicated on the Drawings in conformance with requirements of Section 08 80 00 Glazing.

B. Fabric-Wrapped Tackable Panels: "Homosote Insulation Board" or equal, 24-26 pcf density, with a Class A fire rating, 1/2-inch thick, with exposed faces and edges adhered and completely wrapped in fabric.
   1. Surface shall be wrinkle free with tailored edges.
   2. Fabric: As scheduled in Product and Finish Schedule on Sheet A7.0, or, if not scheduled, as selected by County's Representative.
   3. Panel Edge: Square.
   4. Panel Fasteners: "Velcro" hook-and-loop tape.
   5. Size: To fit casework locations shown on Drawings.

2.7 ACCESSORIES

A. Bumper Pads (Silencers): Hemispherical, quiet clear type, 55 Shore A hardness.
   1. Basis of Design Manufacturer; 3M Bumpon Protective Products, or equal.

B. Adhesive: As recommended by panel manufacturer best suited for the intended use and that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use that has a VOC content of 30 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Fasteners: Size and type to suit application.

E. Counter End Panel Caps: Continuous stainless steel cap with hemmed edges, satin finish as detailed on the Drawings.

2.8 FABRICATION - GENERAL

A. Construction shall conform to NAAWS casework requirements.

B. Make job measurements as required for proper fabrication of the work.

C. Grade: Custom.

D. Door and Drawer Front Style: Flush overlay, WI Style A.

E. Door and Drawer Front Style: Flush overlay, NAAWS Style A.
   1. Drawer and door panel edges shall be square.

F. Carcass Construction: Type A frameless. Provide as single unit at open shelving.

G. Minimum Nominal Thicknesses:
   1. Doors: 3/4 inch.
   2. Drawers:
      a. Sides, Backs, and Subfronts: Wood or panel product, 1/2 inch.
      b. Bottoms: Panel product, 1/4 inch.
      c. Fronts: Lumber or panel product, 3/4 inch.
   3. Body Members: Panel products, 3/4 inch.
   4. Rails: Wood or Panel Products; 3/4 inch.
   5. Shelves: Veneer Core Plywood; 3/4 inch for spans to 36 inches; 1 inch for spans up to 48 inches.
   6. Backs: Panel Product; 1/4 inch.

H. Provide silencers at doors and drawers.

I. Install hardware, and adjust for proper alignment and operation.

J. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal contact surfaces of cut edges.

K. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings and transportation facilities.

L. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

M. Shop Finishing: Prepare for finishing in accordance with the woodworking standard.

N. Back Painting: Surfaces which are not exposed to view at any time and abut walls or floor shall be thoroughly back painted with one heavy coat of finishing material of fabricator's choice before leaving the shop.

2.9 FABRICATION - BAMBOO VENEERED CASEWORK

A. Finish exposed surfaces with specified veneers. Backs of doors shall be considered exposed.
   1. Veneer faces shall be glue spliced. Stitched faces will not be accepted.
   2. Veneer matching shall be continuous across doors, drawer fronts, and panels.
   3. Color, matching, and general appearance shall match sample(s) provided by County’s Representative and approved mockup.

B. Finish semiexposed surfaces with specified cabinet liner, except as otherwise specified.

C. Transparent Finish: Catalyzed lacquer; AWI System 2.
   1. Grade: Custom.
   2. Gloss Level: 40 Satin 30-50 degrees in accordance with ASTM D523 60 degree Gloss Meter.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical and building items affecting casework are placed and ready to receive work.

3.2 INSTALLATION

A. Install cabinetwork plumb and level and in conformance with requirements of NAAWS Standard and as shown.

B. Install cabinetwork plumb and level.
   1. Use concealed shims as required.
   2. Accurately scribe and closely fit all faceplates, filler strips, and trim strips to irregularities of adjacent surfaces.
   3. Anchorage shall be acceptable for Project seismic requirements.

C. Fasten cabinets to floor at toe space, unless base levelers are used, and to walls at 24 inches on center maximum.

D. Anchorage for upper cabinets shall be with screws penetrating studs or backing plate. Secure upper cabinets, using wood or metal cleats. Secure to wall with screws penetrating studs or backing plates.

E. Install sealant as specified in Section 07 92 00 Joint Sealants as required to close any small unavoidable gaps between casework and abutting surfaces.

F. Drawer and door pulls shall be installed centered on drawers and to far edge of doors. If not shown, coordinate required edge distance with County's Representative.

3.3 ADJUSTING AND CLEANING

A. Adjust moving or operating parts to function smoothly and correctly.

B. After installation, wipe finished surfaces to remove marks of handling, and leave in clean condition.

C. All damaged, stained, scratched, or otherwise disfigured portions of the work shall be touched up, refinished, or replaced to satisfaction of the County's Representative.

END OF SECTION 06 41 00

SECTION 06 64 00

DECORATIVE PLASTIC PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Decorative opaque resin wall paneling and column cladding, including preformed outside corners, anchorage, and trim.

B. Related Requirements:
1. Decorative Metal: Section 05 70 00.
2. Interior Architectural Woodwork: Section 06 40 23; metallic laminate used as base at paneling.
3. Joint Sealants: Section 07 92 00.
4. Glazing: Section 08 80 00; translucent resin panel system.
5. Gypsum Board: Section 09 29 00.
6. Product and Finish Schedule: Sheet A7.0.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

1.3 ACTION SUBMITTALS

A. Shop Drawings:
1. Dimensioned plans and elevations, drawn to scale, identifying location of each color and pattern, and location of attachments.
2. Large-scale details identifying components used, and indicating method of attachment.

B. Product Data: Manufacturer's literature describing materials and installation instructions.

C. Sustainable Design (LEED):
1. General:
a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
b. Sustainable design submittals are in addition to other submittals.

c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
d. Credit MR 4:
   1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
   2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
   3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
e. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.
f. Credit EQ 4.1: Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for field-applied adhesives and sealers used inside of the weatherproofing barrier of the building demonstrating compliance with SCAQMD Rule #1168.

D. Verification Samples:
   1. Resin panels, 4 inches square, in each specified color and texture.
   2. Preformed outside corner, 6 inches long, in each color and texture required.
   3. Each type of anchor or fastener.

1.4 INFORMATIONAL SUBMITTALS

A. Statement of fabricator/installer qualifications.

B. Submit product test reports from a qualified independent third party testing agency indicating each type and class of resin panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed test reports will be acceptable if for current manufacturer and indicative of products used on this project.

1.5 CLOSEOUT SUBMITTALS

A. Specified warranty.

B. Maintenance Data: Submit manufacturer's care and maintenance data, including care, repair and cleaning instructions.

1.6 QUALITY ASSURANCE

A. Fabricator/Installer shall be trained and certified by manufacturer.

B. Mockup(s): First installed area or example of paneling, and each installation condition, shall serve as a mockup for review by County's Representative of workmanship, visual effect, and interface with adjacent construction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's standard protective packaging.

B. Immediately upon delivery to jobsite, place materials in area protected from weather.

C. Protect materials from breakage and damage while unloading and when stored.

D. Store materials in a flat orientation in a dry place that is not exposed to weather.

E. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent damage or staining following installation for duration of project.

F. Before installing paneling, permit products to reach room temperature.

G. Comply with additional requirements specified in Section 01 43 00 Quality Assurance – Materials and Equipment and Section 01 65 00 Delivery, Storage and Handling.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard 2 year warranty agreeing to repair or replace units that fail in material or workmanship.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE REQUIREMENTS

A. Sustainability Requirements:
   1. Dynamic environmental testing (ASTM standards D 5116 and D 6670). Panels must not have detectable VOC off-gassing agents and must be have Greenguard™ Indoor Air Quality certified.
   2. Panels must be produced from a minimum of 40 percent post-industrial recycle content. This recycle content must be certified by a recognized third party certification group, such as Scientific Certification Systems (SCS).
   3. Manufacturer must offer a documented reclaim process that will take back, at the manufacturer's cost, panels that are at their end-of life cycle.

B. Fire Performance Requirements:
   1. Rate of Burning (ASTM D 635). Material must attain CC1 Rating for a nominal thickness of 1.5 mm (0.060 in.) and greater.
   2. Self-Ignition Temperature (ASTM D 1929). Material must have a Self-ignition temperature greater than 650°F.

3. Density of Smoke (ASTM D 2843). Material must have a smoke density less than 75 percent.
4. Flame spread and Smoke developed testing (ASTM E 84). Material must be able to meet a level of Class A (Flame spread less than 25 and smoke less than 450) at thickness of one inch.
5. Room Corner Burn Test (NFPA 286). Material must meet Class A criteria at 1/4 inch thickness as described by the 2003 *International Building Code*.
6. Extent of Burning (UL 94). Must submit UL card.
7. UPITT Test for Combustion Product Toxicity: Product must be recorded as "not more toxic than wood".

C. Impact strength: Minimum impact strength test as measured by ASTM D 3763 of 20 ft. lbs. (for durability, shipping, installation, and use).

D. Safety Glazing: Material must attain a Class A impact rating in accordance with ANSI Z97.1-2004 at 1/8 inch thickness.

2.2 WALL PANELING AND COLUMN CLADDING

A. Manufacturer: 3form, Inc., Salt Lake City, Utah, USA / telephone 801-649-2500, or equal.

B. System:
1. Wall Paneling: "Ready to Go Wall Feature 300.41."
2. Column Cladding: "300.41 – Clad Wall Solution System."

C. Materials:
1. Materials: Varia™ produced from ecoresin™ Sheet; polyethylene terephtalate, glycol (PETG) modified resin sheet laminated to interlayer.
   a. Engineered polyester resin.
   b. Panel Sizes: 4 feet x 8 feet, except as otherwise shown.
   c. Thickness: Minimum 1/8 inch.
2. Interlayer Materials: Compatible with polyesters and bonding process to create a monolithic sheet of material when complete.
3. Colors and Designs: As scheduled in Product and Finish Schedule on Sheet A7.0.

D. Hardware and Mounting System:
1. Provide concealed attachment system, except where perimeter hardware is indicated.
2. Perimeter hardware, where indicated, shall act as a perimeter to frame panels.
3. Fasteners: Use screws designed specifically for plastics. Self-threading screws are acceptable for permanent installations. Provide threaded metal inserts for applications requiring frequent disassembly.

E. Trim and Accessories: Provide matching T-profile, edge profile, preformed 90-degree corners, and similar items as shown on the Drawings or required for a complete installation.
   1. Metal trim, where indicated, shall meet requirements of Section 05 70 00 Decorative Metal.

2.3 OTHER MATERIALS

A. Sealant (If Required): Silicone type, as provided by panel manufacturer, meeting requirements of Section 07 92 00 Joint Sealants. Color to match wall panels.

B. Adhesives (If Required): VOC compliant, high quality, low odor, non-flammable, water and mold resistant, latex-based as recommended or provided by panel manufacturer.

C. Provide fasteners, trim, clips, cleaner, and other materials as recommended by panel manufacturer and required for a complete installation.

2.4 FABRICATION

A. Manufacturer's shop shall fabricate items to the greatest degree possible. Where fabricated elsewhere, comply with manufacturer's written instructions.

B. Fabricate to designs, sizes and thicknesses indicated and to comply with indicated standards. Sizes, profiles and other characteristics are indicated on the drawings.

C. Ensure that material is not chipped or warped by machining operations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where installation will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for installation and comply with requirements specified.

3.2 INSTALLATION

A. Comply with manufacturer's written installation instructions.

B. Utilize fasteners, adhesives and bonding agents recommended by manufacturer for type of installation indicated. Material that is chipped, warped, hazed or discolored as a result of installation or fabrication methods will be rejected.

C. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with reviewed submittals, to match accepted mockups.

D. Form field joints using manufacturer's recommended procedures. Locate seams in panels so that they are not directly in line with seams in substrates.

3.3 CLEANING

A. Clean soiled or discolored surfaces after installation.

B. Remove and replace damaged or improperly installed work.

END OF SECTION 06 64 00

SECTION 06 64 20

GLASS-FIBER-REINFORCED PLASTIC PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Glass-fiber-reinforced plastic (FRP) wall paneling.

B. Related Requirements:
   1. Joint Sealants: Section 07 92 00.
   2. Gypsum Board: Section 09 29 00.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.

1.3 ACTION SUBMITTALS

A. Shop Drawings:
   1. Dimensioned plans and elevations, drawn to scale.
   2. Large-scale details identifying components used, and indicating method of attachment.

B. Product Data: Manufacturer's literature describing materials and installation instructions.

C. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
      d. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

e. Credit EQ 4.1: Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for field-applied adhesives and sealers used inside of the weatherproofing barrier of the building demonstrating compliance with SCAQMD Rule #1168.

D. Verification Samples:
1. FRP panels, 8 inches square, in specified color and texture.
2. Trim pieces, 6-inch lengths.

1.4 QUALITY ASSURANCE

A. Materials and installation shall meet USDA/FSIS requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Immediately upon delivery to jobsite, place materials in area protected from weather.

B. Protect materials from breakage and damage while unloading and when stored.

A. Comply with additional requirements specified in Section 01 43 00 Quality Assurance – Materials and Equipment and Section 01 65 00 Delivery, Storage and Handling.

PART 2 - PRODUCTS

2.1 WALL PANELING

A. Glass-Fiber-Reinforced Plastic (FRP) Wall Panels:; "Glasbord" by Crane Composites, Inc., "Marlite FRP" by US Gypsum Co.; "FiberLite" by Nudo Products, Inc.; or equal.
1. Size: 48 inches wide x height shown.
2. Thickness: 0.090 inch, minimum.
3. Flame Spread, ASTM E84: Class C.
4. Smoke Developed, ASTM E84: Under 450.
5. Water Absorption: Not over 0.16 percent.
6. Texture: Embossed.
7. Color: White.

B. Trim: Matching PVC moldings for corners, end caps, and division bars.

2.2 OTHER MATERIALS

A. Sealant: Silicone type, as provided by panel manufacturer, meeting requirements of Section 07 92 00 Joint Sealants. Color to match wall panels.

B. Adhesives: VOC compliant, high quality, low odor, non-flammable, water and mold resistant, latex-based as recommended or provided by panel manufacturer.

C. Provide fasteners, trim, clips, cleaner, and other materials as recommended by panel manufacturer and required for a complete installation.

PART 3 - EXECUTION

3.1 WALL PANELING INSTALLATION

A. Set panels on top of flooring base. Secure to walls with adhesive in accordance with panel manufacturer's instructions.

B. Install matching trim at joints, corners, and other exposed edges.

C. Install panels vertically, cut to required height, without horizontal joints. Where used as a wainscot 48-inches or less in height, install horizontally without vertical joints except where wall length exceeds maximum available panel length. Joints shall be balanced on each wall with each end panel of equal width or length and not less than one-half full size.

D. Seal gaps remaining after installation, using silicone sealant.

3.2 CLEANING

A. Clean soiled or discolored surfaces after installation.

B. Remove and replace damaged or improperly installed work.

END OF SECTION 06 64 20

SECTION 07 21 17

THERMAL BOARD AND BLANKET INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Thermal insulation.
   2. Vapor retarder.
   3. Foam insulation at exterior wall crevices and spaces requiring a thermal seal.

B. Related Requirements:
   1. Gypsum Board: Section 09 29 00.
   2. Acoustical Finishes: Section 09 83 10.
   3. Acoustical Insulation and Sealants: Section 09 82 00.
   4. Plumbing: Division 22; plumbing pipe insulation.
   5. Mechanical: Division 23; mechanical pipe and duct insulation.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.

1.3 ACTION SUBMITTALS

A. Product Data: Manufacturer's specifications and installation recommendations for each type of insulation required.
   1. Provide Underwriter's Laboratory approval numbers for required fire ratings.
   2. Approval of other laboratories is contingent upon acceptance by applicable authorities.

B. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.

2. The following information shall be provided:
   a. Credit MR 4:
      1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
      2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
      3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
   b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.
   c. Credit EQ 4.1:
      1) Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for field-applied adhesives and sealers used inside of the weatherproofing barrier of the building demonstrating compliance with SCAQMD Rule #1168.
      2) Manufacturer's product data for aerosol adhesives used inside of the weatherproofing barrier of the building, including printed statement of VOC content that demonstrates compliance with the limits defined in Green Seal Standard GS-36.

1.4 QUALITY ASSURANCE

A. Thermal resistance factors (R-values) listed are aged values tested in accordance with ASTM C518 at 75 degrees Fahrenheit and 50 percent relative humidity for at least six months.

B. Regulatory Requirements:
   1. Insulation shall be certified by manufacturer to comply with state standards for insulating materials.
   2. Insulation shall comply with Flame Spread Rating and Smoke Density requirements of CBC Section 707.3.
   3. Foam insulation shall comply with CBC.

C. Mockups: First area or example of each type of installation shall serve as a mockup for review of workmanship by County's Representative. Do not proceed with installation until mockup is approved.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Clearly identify manufacturer, contents, brand name, applicable standard, and R-value.

B. Store materials off ground, protected against weather, condensation, and damage.

C. Comply with manufacturer's recommendations for handling, storage, and protection during installation.

D. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

PART 2 - PRODUCTS

2.1 BLANKET INSULATION

A. General: Provide sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.

B. Unfaced Mineral-Fiber Blankets: Preformed slag mineral or glass fiber with thermosetting resin binders, conforming to ASTM C665, Type I; Johns Manville, or equal.
   1. Combustibility: Noncombustible when tested in accordance with ASTM E136.
   2. Fire Resistive Requirements: ASTM E84:
      a. Batt:
         1) Smoke Developed: 50 or less.
         2) Flame Spread: 25 or less.
   3. Thickness and Insulating Value: As shown on the Drawings or as required for R-Value indicated on the Drawings.

2.2 BOARD INSULATION

A. Semi-rigid Mineral Fiber Board: 6.00-pcf density, complying with ASTM C612, Class 1A, and with R value of not less than 4.15 per 1-inch thickness of insulation.
   1. Thickness: 2 inches, unless otherwise indicated.
   2. Fire Resistive Requirements: ASTM E84.
      a. Smoke Developed: 50 or less.
      b. Flame Spread: 25 or less.
   3. Facing: Unfaced.

2.3 SHEET MATERIALS

A. Vapor Retarder: 6-mil polyethylene sheeting complying with D4397.

2.4 ACCESSORIES

A. Perimeter Gap Sealant: As specified in Section 07 92 00 Joint Sealants.

B. Sill Sealer: Self-adhesive air and moisture barrier; “Triple Guard Energy Sill Sealer” by Protector Wrap, or equal.

C. Vapor-Retarder Tape: Minimum 2-inch-wide self-adhering type designed to maintain vapor retarder integrity.

D. Fasteners for Mechanical Attachment of Insulation:
   1. Spindle Anchors: Galvanized- or electroplated-steel penetration supports with adhesive attachment to substrate and support disc sized to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter; Gemco "Self Stic," "Insul-Anchors" by Continental Stud Welding, Ltd, or equal.
   2. String Wires: Minimum 18 gage galvanized steel wire.

E. Adhesives: As recommended by insulation manufacturer for insulation and fastener types and substrates involved.

F. Additional Fastenings, Straps, and Accessories: As acceptable to insulation manufacturer and required to secure insulation in place.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas scheduled to receive insulation to ensure protection against inclement weather and other hazards and to verify that work of preceding trades is completed.

B. Examine space allocated for insulation for proper depth to receive material.

C. Proceed with installation when conditions are satisfactory.

D. Prior to closing walls or ceilings, obtain observation by County's Representative of insulation installation.

3.2 INSTALLATION OF THERMAL BLANKETS

A. Install faced blankets with facing to building interior.

B. Install to fill all typical and odd spaces completely in framing where required, other than providing air space where indicated.

C. Install snugly between framing members. [Staple tab ends to outside edge of stud and joist between units and against adjacent construction].

D. Trim to required height and width in place.

E. Carefully cut and fit insulation around pipes, conduit, and other obstructions and penetrations. Split blankets around wires as required.

F. Wall blankets shall be pushed tight to sheathing then pulled forward until flush with face of stud.

G. In addition to fastening at tabs, support blankets on straps where ceiling is furred below framing to prevent blankets from sagging.

H. Where wall blankets are not in contact with gypsum board, provide straps to prevent sagging.

I. Shim space between framing and window and door jambs shall be filled solid with unfaced batt or foam-in-place insulation. Fill spaces completely to a uniform monolithic density without voids.

J. Seal joints and edges of faced insulation with specified vapor-retarder tape to provide an effective vapor retarder.

3.3 SUSPENDED HORIZONTAL INSULATION

A. Fasteners:
   1. Provide insulation fasteners at typical spacing specified, except not less than two fasteners for any single piece.
   2. Install 3 to 4 inches from panel edges and ends and not more than 18 inches on center in between.
   3. Secure each metal clip base in full bed of adhesive as recommended by manufacturer.
   4. Do not install panels until clip adhesive is fully set.

B. Lay out panels for minimum of joints and with any single piece not less than 24 inches wide nor less than 48 inches long, unless otherwise approved.

C. Offset intermediate end joints in adjacent panels not less than 24 inches.

D. Cut panels in straight lines using tools which minimize fraying.

E. Neatly and carefully precut slots through panels to facilitate placing insulation over fasteners and hangers for suspended ceilings, fixtures, and equipment.

F. Install panels fully bearing against substrates and neatly and tightly fitted at joints and around surfaces of penetrations.

G. Install fastener caps firmly against panel faces without compressing insulation. Turn clip prongs or stems flat against caps.

3.4 VAPOR RETARDER

A. Install over metal studs and batt insulation at exterior walls where indicated on the Drawings.

B. Tape sheet to studs unpunctured with taped seams for an airtight enclosure.

3.5 PROTECTION

A. Coordinate with other Sections for prompt installation of finishes.

B. Where coordination with other Sections is not practical, protect insulation and vapor retarder by temporary covering or enclosure.

END OF SECTION 07 21 17

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Sheet metal for maintaining weather and water resistance of building enclosure at new construction and penetrations, including roof penetrations.
   2. Sealant work related to sheet metal flashing and trim.
   3. Requirements for miscellaneous sheet metal integral with products and systems included under other Sections.

B. Related Requirements:
   1. Flexible Flashing and Underlayment: Section 07 65 00.
   2. Aluminum-Framed Storefronts: Section 08 43 13; flashing for aluminum storefronts.
   3. Painting and Coating: Section 09 90 00.
   4. HVAC: Division 23; mechanical equipment.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
   3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

B. Coordinate with shop drawing, mockup, and warranty requirements of other Sections installed in conjunction with work of this Section.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Fully detailed, large-scale drawings for fabrication and installation layout of sheet metal flashing and trim including plans, elevations, and keyed details. Distinguish between shop and field-assembled work. Include the following:
   1. Identification of material, thickness, weight, and finish for each item and location in project.
   2. Details for forming sheet metal flashing and trim including profiles, shapes, seams, and dimensions.
   3. Details for securing, joining, supporting, and anchoring sheet metal flashing and trim including fasteners, cleats, clips, and other attachments.
   4. Details showing interface and relationship to adjacent materials.

5. Details of special conditions.

B. Product Data: Manufacturer's literature describing manufactured items.

C. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 4:
         1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
         2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
         3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
      b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

D. Samples:
   1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
   2. Trim, Metal Closures, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
   3. Accessories and Miscellaneous Materials: Full-size sample.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification of fabricator.

1.5 CLOSEOUT SUBMITTALS

A. Extended warranty.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Deliver sheet metal flashing materials and fabrications undamaged. Project sheet metal flashing, trim materials, and fabrications during transportation and handling.

C. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

1.7 FIELD CONDITIONS

A. Coordinate with installer where work is to be performed on a daily basis so that protection of personnel, equipment, and materials below work area are properly protected.

B. Proceed with installation only when existing and forecasted weather conditions permit system to be installed according to manufacturer's written instructions and warranty requirements.

C. Installation shall not proceed if an unusual condition is discovered or that will preclude work to be performed in accordance with the Drawings and Specifications. Contractor shall immediately report this finding to the Architect for discussion and resolution.

D. Roofing and waterproofing surfaces shall be kept clean and free of debris. Scrap metal, fixings, and other materials shall be removed at the end of each work day to prevent damage to the roofing and waterproofing systems.

1.8 WARRANTY

A. Contractor: Provide written 2-year warranty agreeing to repair or replace work that fails in materials or workmanship. Failure includes failure to perform as specified and/or deterioration of finish or construction in excess of that to be expected under normal weathering.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. Industry Standards:
   1. Conform to applicable provisions of the "Architectural Sheet Metal Manual" of the Sheet Metal and Air Conditioning Contractors' National Association Inc. (SMACNA Manual), except where more stringent requirements are specified or shown.
   2. Conform to applicable provisions of NRCA "Roofing and Waterproofing Manual."

B. Installed flashing and sheet metalwork shall be weathertight. Coordinate with work of other Sections for weathertight installation at interface with other materials and systems.

C. Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

D. Provide materials that are compatible with one another and with existing construction under conditions or service and application required, as demonstrated by testing and field experience.

E. Provide sheet metal flashing and trim that allows for thermal movement resulting from the maximum ambient and surface temperatures expected by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects.

2.2 SHEET METAL

A. General:
1. Thickness: As required by SMACNA for specific conditions and as shown on Drawings but not less than 24-gage.
2. Thickness at continuous cleats shall be minimum 20-gage.

B. Metallic-Coat Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and shop painted by the coil-coating process to comply with ASTM A755/ A755M.
1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, Z275 (G90) coating designation; structural quality.
2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792/A792M, Class AZM150 coating designation, Grade 275 (Class AZ50 coating designation, Grade 40); structural quality; “Zincalume,” “Galvalume,” or “Zintro-Alum” manufactured under license from BIEC International, Inc., Vancouver, WA.

C. Aluminum: ASTM B209, alloy 3003, 0.032 inch thick, except as otherwise indicated.

2.3 ACCESSORIES

A. Self-Adhesive Flashing: As specified in Section 07 65 00 Flexible Flashing and Underlayment.

B. Fasteners: Hot-dip galvanized or 300 series alloy stainless steel.
1. Provide rivets of minimum 3/16 inch diameter, sheet metal screws, machine screws, self-tapping screws, and stove bolts of types and sizes best adapted to conditions of use.

2. Pop rivets may be used for metal-to-metal connections when future disassembly is not required and where not exposed to view.
   a. Open-end type may be used for all applications, except where watertight connections are required, in which case, use closed-end type.
   b. Use pop rivets made from same type material as metals to be fastened.
3. Fasteners exposed to view shall be reviewed with Architect. Finish exposed fasteners to match adjacent surface.
4. Provide stainless steel/EPDM washers at exposed fastener locations.

C. Solder:
1. For Zinc-Coated (Galvanized) Steel: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.
2. For Lead: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead.

D. Flashing Cement: ASTM D4586.

E. Lead Flashing (If Required): 4-pound sheet of common desilverized pig lead. Use only at ferrous roof penetrations.

F. Slip Sheet: Rosin-sized, unsaturated building paper, 4 to 6 pounds per 100 square feet; FS UU-B-790, Type I, Grade A.

G. Pressure Bars and Termination Bars: Stainless steel or aluminum, sizes and types shown on the Drawings.

H. Sealant: As specified in Section 07 92 00 Joint Sealants.

I. Neoprene Pads: Shore 80 hardness, minimum 3.2mm (1/8 inch) thick.

J. Draw Bands: Type 304 stainless steel sheet with Type 304 stainless steel screw.

2.4 FABRICATION

A. Fabricated Metal Flashing and Trim:
1. Shop-fabricate flashing, trim, expansion joints, and similar items from specified galvanized steel, unless otherwise noted, to comply with profiles and sizes shown and in accordance with standard details shown in "Architectural Sheet Metal Manual" by SMACNA.
2. Finished work shall be strong and rigid, neat in appearance, and free from defects.
3. Surfaces shall be smooth and free from warping or buckling.
4. Seams and joints shall be kept to a minimum.
5. Width of Seams:
   a. Flat Lock Seam: 1/2 inch wide.
   b. Lapped Seam, Soldered, Subject to Stress: 1 inch wide.
   c. Lapped Seam, Soldered, not Subject to Stress: 1/2 inch wide.
   d. Lapped Seam, Expansion Joint, Filled with Sealant Tape: 4 inches wide.

e. Where lapped expansion provision cannot be used, form expansion joints of intermeshing hooked flanges, not less than 25mm (1 inch) deep, filled with butyl sealant within concealed joints.

6. Metal sheets in straight runs shall be made up of lengths of not less than 8 feet.
7. Joints exposed to view shall be flush butt joints separated by a 3/8-inch space with backing plate bedded watertight in sealant. Other joints shall be lapped unless otherwise shown on Drawings.
8. Fabricate sheet metal flashing and trim in thickness or weight necessary to comply with performance requirements, but not less than that specified for each application and metal.
9. Obtain field measurements for accurate fit before proceeding with shop fabrication.
10. Conceal fasteners and expansion provision where possible on exposed to view sheet metal flashing and trim, unless otherwise indicated.
11. Fabricate cleats and attachment devices from the same material as accessory being anchored.
12. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG "Loss Prevention Data Sheet" 1-49 for application, but not less than thickness of metal being secured.
13. Exposed edges of sheet metal flashing shall be folded and hemmed.
14. Fabricate inside and outside corners, intersections, and complex flashing conditions in shop with folded, constructed, mechanically fastened, and soldered joints.

B. Install specified slip sheet over preservative-treated wood that would otherwise be in direct contact with sheet metal.

C. Pans at Roofing Penetrations (If Indicated): Fabricate in accordance with SMACNA recommendations. Coordinate filling of pan with roofing Section.

D. Metal Pan Flashing at Wall Openings (If Indicated): Turn up at ends to create a dam, 2 inches minimum. Solder seams. Coordinate with installer of windows, louvers, or other items to be installed at openings.

E. Soldering:
1. Clean and flux metal prior to soldering.
2. Sweat solder completely through seam width.
3. Make exposed soldering full flowing and smooth with finish surfaces.
4. Wash acid flux with an appropriate neutralizer solution after soldering, and remove soldering flux on exposed and painted surfaces.
5. All soldered joints shall be mechanically fastened.

F. Expansion and Contraction:
1. Provide for thermal expansion and contraction and building movement in completed work without overstressing materials, breaking connections, or producing wrinkles and distortion in finished surfaces.

2. Make water- and weathertight throughout.
3. Where subject to thermal expansion and contraction, attach members with clips to permit movement without damage, or provide slotted or oversize holes with washers.
4. Make lock seam work flat and true to line. Sweat full of solder, except where installed to permit expansion and contraction.
   a. Lap flat lock seams. Lap seams where soldered according to pitch.
   b. Make seams in direction of flow.
   c. Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges as specified
5. Space movement joints at a maximum of 8 feet with no joints allowed within 24 inches of a corner or intersection.

2.5 FINISHES

A. Shop Primer Coating for Galvanized Steel:
   1. Pretreatment: Vinyl wash; ICI Dulux 7113 or equal.
   2. Primer: One coat zinc dust type; ICI Dulux 25 or equal.
   3. Field-Applied Finish Coat: As specified in Section 09 90 00 Painting and Coating.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that substrates are smooth and clean to extent needed for sheet metalwork.

B. Verify that nailers, cants, and blocking to receive sheet metal are installed and suitable to receive sheet metalwork.

C. Before installing sheet metal, verify shapes and dimensions of surface to be covered.

D. Notify the County's Representative of any discrepancies between the Drawings and field conditions, and of any elements that required repair.

E. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to installer or applicator. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION

A. General:
   1. Comply with details and profiles indicated on Drawings and SMACNA "Architectural Sheet Metal Manual" recommendations for installation of the work.
   2. Coordinate installation with other work that comprises entire system of weatherproofing, waterproofing, and rain drainage.

3. Conceal fastenings, except as otherwise indicated.
4. Conceal reinforcement within finished assembly.
5. Unless otherwise noted, separate dissimilar metals with suitable coating. Coating shall be invisible in finished work, except for ends of sections.
6. Install work watertight, without waves, warps, buckles, fastening stresses, distortion, "oil canning," and true to line and surface, allowing for expansion and contraction.
7. Torch cutting of sheet metal flashing and trim is not permitted.

B. Flashings:
1. Install flashings and counterflashings where shown or required to provide watertight protection.
2. Install self-adhesive flashing as specified in Section 07 65 00 Flexible Flashing and Underlayment where shown.
3. Counterflashing:
   a. Coordinate installation of counterflashing with installation of roofing or waterproofing membrane termination.
   b. Extend counterflashing 4 inches over roofing or waterproofing.
   c. Lap counterflashing joints a minimum of 4 inches and bed with butyl sealant.
   d. Secure in a waterproof manner by means of anchor and washer spaced at 36 inches centers maximum.
4. Pipe or Post Counterflashing Flashing:
   a. Install counterflashing umbrellas with close-fitting collar with top edge flared for elastomeric sealant extending minimum of 4 inches over lead flashing or waterproofing membrane.
   b. Install stainless steel draw band and tighten.
5. Roof Slab Penetration Flashing:
   a. Coordinate installation of roof penetration flashing with installation of roofing and other items penetrating roof.
   b. Provide separate lead flashing cap at top of penetration.
6. Penetration Flashing Through Base Flashing: Provide prefabricated collar flashing soldered watertight with minimum 100mm (4 inch) flanges.

C. Manufactured Vents: Install in accordance with manufacturer's instructions and as detailed on Drawings.

D. Conceal fasteners, except those specifically indicated on the Drawings to be exposed.

E. Apply sealants as specified in Section 07 92 00 Joint Sealants.

3.3 FIELD QUALITY CONTROL

A. Maximum Deviation from Alignment When Erected: 1/4 inch in 20 feet, non cumulative.

3.4 CLEANING AND TOUCH-UP

A. Touch up shop-applied primer on galvanized sheet metal, and paint as specified in Section 09 90 00 Painting and Coating.

B. Clean finished surfaces in accordance with manufacturer's instructions. Clean and neutralize flux materials. Clean off excess solder.

END OF SECTION 07 62 00

SECTION 07 65 00

FLEXIBLE FLASHING AND UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Self-adhering sheet flashing at perimeter of window and louver openings, and other locations where shown.
2. Additional flexible flashing and underlayment as indicated.

B. Related Requirements:
1. Gypsum Sheathing: Section 06 16 43.
2. Sheet Metal Flashing and Trim: Section 07 62 00.
3. Aluminum-Framed Storefronts: Section 08 43 13; storefronts, windows, and fixed glass.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.

B. Coordination:
1. Coordinate with other Sections for continuity of waterproofing of building envelope at interface of flashings and underlayment installed by various trades.
2. Coordinate with installers of anchorage for work anchored to substrate or otherwise penetrating self-adhering membranes, to ensure that all penetrations are sealed.

1.3 ACTION SUBMITTALS

A. Product Data: Manufacturer's descriptive data for proposed product, installation instructions, use limitations of materials, and recommendations for proposed installation.

B. Sustainable Design (LEED):
1. General:
a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
b. Sustainable design submittals are in addition to other submittals.

c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.

2. The following information shall be provided:
   a. Credit MR 4:
      1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
      2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
      3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
   b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

1.4 DELIVERY, HANDLING, AND STORAGE

A. Store materials away from sparks or flames, protected from rain and physical damage, and within temperature range recommended by manufacturer.

B. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

1.5 FIELD CONDITIONS

A. Temperature of air and surfaces to receive underlayment shall be within the range recommended by system manufacturer.

B. Substrate surfaces shall be dry at application.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Self-Adhering Sheet Underlayment for Roof Conditions: 40-mil-thick composite of polyethylene film and self-adhesive, rubberized asphalt, with embossed slip-resistant surface; "Grace Ice and Water Shield" by Grace Construction Products, or equal.
   1. Width:
      a. Typical: 36 inches.
      b. Provide membrane in manufacturer's standard strip widths where applicable for conditions of use.
   2. Minimum Exposure Limit: 30 days.

B. Self-Adhering Sheet Underlayment for Wall Conditions: 40-mil-thick composite of high-density, cross-laminated, polyethylene film, coated on one side with rubberized asphalt, with disposable release sheet; "Perm-A-Barrier Wall Membrane" by Grace Construction Products, "Sealtight Air Shield" by W.R. Meadows, or equal.

C. Primer at “Fuzzy” Sheathing: “Perma Barrier WB” by Grace Construction Products, or equal.

D. Sheet Underlayment (If Indicated): Either of the following:
   1. Unperforated, asphalt-saturated felt, Class D 1-hour organic felt complying with ASTM D226, Type I (No. 15).
   2. Asphalt-saturated Kraft paper complying with FS UU-B-790a, Type I, Grade D, Style 2, 60 minute; "Jumbo Tex" by Fortifiber Corp. or equal. At Contractor’s option, two-ply 60 minute “Super Jumbo Tex” may be used in lieu of two single layers.

E. Self-Adhering Flashing: 40 mil thick, self-adhesive narrow width roll of rubberized asphalt integrally bonded to a high density, cross-laminated, polyethylene film; "Perm-A-Barrier Detail Membrane" by Grace Construction Products, or equal.
   1. Width: As selected by Contractor for conditions of use from manufacturer’s standard roll widths.

2.2 ACCESSORIES

A. Mechanical Fasteners: Washer-type, as recommended by membrane manufacturer for attachment to substrate.

B. Sealant for Flexible Flashing and Underlayment: Sealing mastic as provided or recommended by membrane manufacturer.

C. Liquid Membrane: Two-component, 100 percent solids modified urethane, cold-applied; "Bituthene Liquid Membrane."

D. Additional Accessories: Provide as recommended by manufacturer for conditions of installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check to ascertain whether surfaces to receive sheet membrane flashing or underlayment are free of dirt, debris, sharp protrusions, and irregularities at joints.
   1. Correct deficiencies.
   2. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Where priming is required, prime substrates with primer suitable for each substrate and recommended for this use by membrane manufacturer.
   1. Prime concrete if bottom of membrane overlaps and is adhered to concrete foundation or slab. Prime only areas that can be covered with membrane on the same day. Re-prime areas not covered with membrane within 24 hours.
   2. Prime other substrates as recommended by manufacturer for installation of sheet membrane.

B. At external corners or gaps in sheathing, install liquid membrane to smooth and ease gaps, and to round corners.

3.3 INSTALLATION OF SELF ADHERING FLASHING AND UNDERLAYMENT

A. Install at locations specified and as shown on Drawings. Coordinate the installation of the self-adhesive membranes with the waterproofing and roofing systems to ensure continuity of self-adhesive underlayment with other waterproofing assemblies.

B. Flashing at Openings: As shown on the Drawings or, if not shown, in accordance with details and recommendations of manufacturer.
   1. Fold and lap flashing to prevent water from migrating behind underlayment.
   2. Provide sealant at any “pinholes.”

C. Press membrane into place using heavy hand pressure, or roll with a wall or countertop roller.

D. Patch tears and inadequately lapped seams.

E. Provide mechanical fasteners where recommended by membrane manufacturer. Fastener heads shall be sealed with liquid membrane.

F. Seal joints caused by pipes, conduits, electrical boxes, anchors, and similar items penetrating membrane with liquid membrane to create an airtight seal between penetrating objects and membrane. Apply liquid membrane to seal termination edges.

G. Seal all top edges of self-adhesive membrane with liquid membrane.

H. Inspect membrane for continuity. Patch tears, fishmouths, damage, and inadequately lapped seams in accordance with manufacturer's instructions.

I. Apply overlying materials within allowable exposure time limits specified and stated in manufacturer's instructions.

END OF SECTION 07 65 00

SECTION 07 76 18

ROOF PAVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Pavers at Third Floor Roof Patio, extension of existing paver area to match similar existing work, over existing roofing.

B. Related Requirements:
   1. Sheet Metal Flashing and Trim: Section 07 62 00.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.

B. Coordinate with County's Representative to determine manufacturer and composition of existing roofing, and whether existing roofing is under warranty, if such information is available.

1.3 ACTION SUBMITTALS

A. Shop Drawings:
   1. Dimensioned plan of area to receive paver system, drawn to scale, showing paver layout and interface with adjacent roof mounted items.
   2. Details showing termination conditions, support for cut pavers, interface with adjacent construction, and installation over sloped substrate.
   3. Manufacturer's standard details, modified to show actual Project conditions, are acceptable.

B. Product Data: Manufacturer's material specifications and installation instructions for pavers, paver supports if applicable, and installation accessories. Include test reports for paver supports if applicable, verifying compliance with ASTM D1929.

C. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.

c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.

2. The following information shall be provided:
   a. Credit MR 4:
      1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
      2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
      3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
   b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

D. Samples:
   1. Selected pavers, full size.
   2. Accepted samples may be installed as part of specified mockup and/or finished construction.

1.4 INFORMATIONAL SUBMITTALS

A. Statement of installer qualifications.

B. Certified laboratory or field tests for slip resistance as specified if not included with product data submittal.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Minimum of two years proven construction experience, be capable of estimating and building from the Drawings, determine elevations, and properly handle materials.

B. Mockup: First installed area of paver system at each location, to illustrate termination conditions and installation over sloped substrate, shall serve as a mockup for review and approval by County's Representative of workmanship, visual effect, visual match with similar existing work, and interface with adjacent construction.
   1. Size: Not less than 100 square feet.
   2. Coordinate location of area with County's Representative.
   3. Mockup shall illustrate interface with existing pavers.
   4. Mockup shall illustrate interface with thresholds at doors.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE REQUIREMENTS

A. Slip Resistance: Pavers shall provide a value equal to or greater than 0.42 when tested in accordance with DCOF AcuTest procedure contained in ANSI A137.1:2012, Section 9.6.
   1. If manufacturer or supplier of selected pavers does not have test data to substantiate compliance with DCOF AcuTest value, provide alternative testing to verify compliance, including static coefficient value of 0.60 for level surfaces as determined by testing identical products in accordance with ASTM C1028, if acceptable to governing authorities.
   2. Laboratory tests shall be made on a minimum of three pavers proposed for use.

B. Paver system shall maintain roof membrane UL Class A requirements and warranty.

C. All products shall be compatible with one another and with other specified or existing products with which they may come in contact.

2.2 PAVERS

A. General: Select products to match similar existing work. In case of conflict or discrepancy, request determination by County's Representative.

B. Pavers: 100 percent recycled porcelain aggregate to match similar existing pavers; Tectura Designs "EcoPremier" Series by Wausau Tile, Inc., Hanover Pavers by Hanover Architectural Products, Plaza Pavers by Westile, or equal.
   1. Color: To match similar existing pavers; subject to approval by County's Representative.
   2. Surface Texture: To provide appearance of finely bush-hammered limestone and meet specified slip-resistance.
   3. Size: Minimum 18 inches by 18 inches nominal (unless otherwise required to match similar existing pavers).
   4. Thickness: As recommended by manufacturer for size and location of use; 1-3/4 inches to 2 inches thick.
      a. Top of installed pavers shall be flush with top of existing pavers.
   5. Physical Properties:
      a. Average Compressive Strength: Not less than 8,000 psi when tested in accordance with ASTM C140.
      b. Average Flexural Strength: Not less than 800 psi when tested in accordance with ASTM C293.
      c. Water Absorption: Less than 6 percent when tested in accordance with ASTM C140.
      d. Freeze/Thaw Resistance: Equal to, or less than, 1 percent loss of dry weight when tested for 50 cycles in accordance with ASTM C1262.
      e. Center Load Capacity: 1,850 pounds using test method acceptable to the County's Representative.

2.3 ACCESSORIES

A. Protection under Pavers: As recommended for compatibility with existing roofing waterproofing membrane; Bison Floating Insulation Base (FIB), or equal.

B. Provide suitable shims, levelers, and other accessories as required for a neat, flush, uniform installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that existing membrane roofing and related flashings are fully inspected or tested, repaired if necessary, and sloped to drain.

B. If existing roofing and related flashings are deteriorated or in obvious need of repair, bring the situation promptly to the attention of County's Representative, in writing.

3.2 INSTALLATION OF PAVERS

A. General: Installation described below for underlayment and paver system is a general summary. Refer to underlayment manufacturer's printed literature technical manual for complete and more detailed instructions to be followed.

B. Preparation:
   1. Establish accurate lines, levels and pattern.
   2. Broom clean substrate. Substrate shall be free of debris that could impair the performance or installation of the paver system.

C. Paver Installation
   1. General:
      a. Position and install pavers in accordance with manufacturer's instructions for paver size and layouts shown on the Drawings.
      b. Use suitable shims and levelers if required to level pavers.
      c. Provide additional individual support beneath bottom features if required.
   2. Lay out pavers to ensure unrestricted flow to roof drains.
   3. Paver heights shall be adjusted to ensure top of pavers is at required elevation at door thresholds and at interface with existing pavers.
   4. Install pavers for uniform space of not over 1/8 inch between pavers.

D. Any area of a paving not restrained by a perimeter wall or curb shall be 'boxed-in' and contained. No movement is allowed at the perimeter of the paving system greater than 1/8 inch.

3.3 FIELD QUALITY CONTROL

A. Inspect often during installation to ensure that grid spacer lines are maintained in a straight and consistent pattern, and that pavers are level and not rocking.

B. Unless otherwise specified in writing to allow for expansion, inspect to ensure that spacing between pavers and at perimeter containment does not exceed 1/8 inch.

C. Ensure that pedestrian entry or access points to Roof Patio are level, and that the paver surface is not randomly raised or uneven, creating a tripping or safety hazard.

END OF SECTION 07 76 18

SECTION 07 87 20

ELEVATOR SMOKE-CONTAINMENT SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Smoke-containment system to be installed over existing elevator hoistway doors.

B. Related Requirements:
1. Joint Sealants: Section 07 92 00; paintable silicone sealant at inside and outside perimeter of auxiliary rails, cove bases and housing.
2. Gypsum Board: Section 09 29 00.
3. Painting and Coating: Section 09 90 00.
4. Electrical: Division 26; 120V control circuit power including conduit, boxes, conductors, wiring devices, smoke detectors, and emergency power.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout.

B. Pre-Installation Meeting:
1. Schedule and convene a pre-installation meeting prior to commencement of installation with representatives of the following in attendance: County's Representative, Contractor, smoke containment system sub-contractor, and electrical sub-contractor.
2. Review substrate conditions, requirements of related work, installation instructions, storage and handling procedures, and protection measures.
3. Keep minutes of meeting including responsibilities of various parties and deviations from specifications and manufacturers' installation instructions.

C. Coordinate interface of smoke detectors with the elevator smoke containment system.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Indicate the following:
1. Hoistway opening width and height, frame profile, projection from finished wall, face width, material, and finish.

2. Show mounting and relationship to adjacent construction, including elevator shaft and opening, floor, and improvements or projections on lobby wall within 12 inches of frame for hoistway opening, floor to ceiling. Include field-measured locations of elevator position indicator, hall call station, and signage.
3. Indicate required clearances for installation.
4. Indicate electrical work by Division 26 required for installation of system. Include smoke detector and auxiliary contacts, auxiliary contact line voltage, and connection to an auxiliary power source.

B. Product Data: Manufacturer's complete product data and installation instructions.

1.4 INFORMATIONAL SUBMITTALS

A. Verification of compliance with specified performance criteria and standards.

B. Verification of installer qualifications.

C. Minutes of pre-installation meeting.

1.5 CLOSEOUT

A. Report on field testing.

B. Certificates or operating permits as required by governing authorities.

C. Maintenance manual with operating and maintenance instructions, emergency information, spare parts list, and similar information.

D. Manufacturer's standard one-year warranty.

1.6 QUALITY ASSURANCE

A. Comply with the applicable requirements of the following:
1. NFPA 105, “Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives.”
2. ICC-ES AC77, “Acceptance Criteria for Smoke Containment Systems Used with Fire-resistance-rated Elevator Hoistway Doors and Frames.”

B. Smoke containment system shall be accepted and listed by the State Fire Marshal.

C. Installer Qualifications: Factory-trained personnel.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Smoke-Containment System: "Model 400" by Smoke Guard Corporation, Boise, ID, or equal (no known equal).

B. Label each smoke containment system with following information:
   1. Manufacturers' name.
   2. Maximum leakage rating at specified pressure and temperature conditions.
   3. Label of quality control agency.

2.2 DESIGN AND PERFORMANCE REQUIREMENTS

A. Curtain shall automatically close when activated by smoke detector on ceiling of elevator lobby or fire alarm control panel. Curtain shall seal magnetically to frame for hoistway opening providing a virtually airtight seal at hoistway opening, thereby inhibiting smoke from a building fire from migrating vertically via the elevator shaft.

B. In open position, system shall not interfere with hoistway door operation.

C. Maximum Air Leakage Rate: Less than 3 cfm per square foot of door opening at 0.1 inch WG pressure at 400 degrees F, in accordance with CBC.

D. Release mechanism shall comply with UL Standard No. 864.

E. System shall be listed and labeled by an independent testing laboratory meeting the requirements of the ICC-ES.

2.3 MATERIALS

A. Curtain: One-mil-thick, transparent, fiber-reinforced, polyamide plastic film that does not burn or melt.
   1. Flexible multi-pole magnetic strips shall be attached to each longitudinal edge of film, using a continuous bead of low-modulus silicone adhesive.
   2. Two 1/8-inch-wide strips of 0.002-inch-thick, synthetic elastomer, two-stage, laminating adhesive shall be attached to face of flexible magnets.

B. Housing: Provide a self-contained metal housing, recessed in ceiling above elevator door as shown.
   1. Construction: 20 gage cold rolled steel with dust cover and door with concealed hinges.
   2. Include mounting plate.

C. Rewind Motor: NFPA 70, 90v DC.

D. Release Mechanism: IAS (IAS is a trademark of International Accreditation Service) Accredited Testing Laboratory Labels for UL Standard 864.

E. Rewind switch to rewind curtain into housing. Coordinate switch location with Fire Marshal prior to installation.

F. Label indicating manufacturer's name, maximum leakage rating at specified pressure and temperature conditions, and label of quality control agency.

G. Additional Components: Provide as required for a complete installation:

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that frames for hoistway openings meet requirements for mounting smoke-containment system.

B. Verify that required electrical work is in place.

C. Verify that clearances are sufficient.

3.2 PREPARATION AND INSTALLATION

A. Submit and obtain approval from the Fire Department prior to system installation.

B. Install system in accordance with manufacturer's instructions, code requirements, and reviewed submittals.

C. Electrical: Make final smoke-detector and rewind-switch connection. Use conduit for wiring above fire-rated ceiling. Coordinate with Division 26 Electrical.

D. Install housing.
   1. Maintain 1/8 inch clearance at perimeter.
   2. Finish housing as specified in Section 09 90 00 Painting and Coating. Do not paint housing door shut or fill hinge with paint.

3.3 FIELD QUALITY CONTROL

A. Field Test: Follow manufacturer's cycle test procedures.

B. Notify County's Representative, local Fire Marshal, alarm sub-contractor and elevator sub-contractor, and elevator service company, if retained by County, minimum one week in advance of scheduled testing.

C. Complete maintenance service record.

3.4 DEMONSTRATION

A. Verify that system is operational as required and recommended by code and governing authorities.

B. Demonstrate required testing and maintenance procedures to County personnel.

END OF SECTION 07 87 20

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Include:
   1. Exterior sealants and calking work required to weatherproof the building in areas of new construction and as indicated on the Drawings.
   2. Interior sealants and calking.

B. Related Requirements:
   1. Glazing: Section 08 80 00; glazing sealants.
   2. Acoustical Insulation and Sealants: Section 09 82 00.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
   3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

1.3 ACTION SUBMITTALS

A. Product Data: Manufacturer's specifications, recommendations, and installation instructions, including cleaning of joint surfaces, for each sealant material to be used.

B. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

b. Credit EQ 4.1: Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for field-applied adhesives and sealers used inside of the weatherproofing barrier of the building demonstrating compliance with SCAQMD Rule #1168.

C. Samples: Color selection for each product exposed to view; manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available.

1.4 CLOSEOUT SUBMITTALS

A. Extended warranty.

1.5 QUALITY ASSURANCE

A. Material Compatibility: Sealant materials shall be compatible with one another and with other specified and existing materials, under conditions of service and application required.

B. Mockups: Provide joint sealants for mockups specified in other Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with manufacturer's labels. Labels on delivered materials shall show manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

C. Comply with additional requirements specified in Section 01 43 00 Quality Assurance – Materials and Equipment and Section 01 65 00 Delivery, Storage and Handling.

1.7 WARRANTY

A. General:
1. Repair or replace joint sealants that fail to achieve airtight and watertight seal or otherwise fail to perform as intended because of leaking, crumbling, hardening, shrinkage, bleeding, sagging, staining, loss of adhesion or cohesion, or do not cure within the specified warranty periods.

2. Extended warranties specified in this Section exclude deterioration or failure of joint sealants from the following:
   a. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   b. Disintegration of joint substrates from natural causes exceeding design specifications.
   c. Mechanical damage caused by individuals, tools, or other outside agents.
   d. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

B. Contractor: Provide County with a written 2-year warranty, co-signed by installer, agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

C. Manufacturer: Provide County with manufacturer's written 20-year warranty for sealant Types 1A and 1B agreeing to furnish sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty shall include failure due to loss of adhesion, weather seal. In addition, Type 1B sealant warranty shall include staining.
   2. Contractor shall be responsible for scheduling, arranging, and providing any print review and testing required by manufacturer as a condition for issuance of its warranty.

PART 2 - PRODUCTS

2.1 SEALANT MATERIALS

A. Colors:
   1. Concealed Material: Any of manufacturer's standard colors.
   2. Exposed Material: Manufacturer's standard colors, as selected by the County's Representative.

B. Type 1A - Sealant for General Exposed Exterior Use: One part, neutral cure, gun-grade silicone conforming to ASTM C920, Type S, Grade NS, Class 50; Dow Corning "795 Building Sealant," "SilPruf" by Momentive Performance Materials, or equal.

C. Type 1B - Sealant for Use at Brick, Stone, Concrete and Other Porous Surfaces: One part, medium modulus, silicone polymer conforming to ASTM C920, Type S, Grade NS, Class 50 and formulated to reduce or eliminate dirt pickup, surface streaking, and substrate staining; Dow Corning "756 SMS," "SCS9000 SilPruf NB" by Momentive Performance Materials, or equal.

D. Type 1C - Sealant in Contact with Self-Adhering Underlayment: One part, neutral cure, gun-grade silicone conforming to ASTM C920, Type S, Grade NS, Class 25; Dow Corning "758 Weather Barrier," or equal.

E. Type 2A - Exterior Sealant for General Use: ASTM C920, Type S, Class 25, Grade NS, single-component, silyl-terminated polyether; BASF “Sonolastic 150," or equal.

F. Type 3 – Not Used.

G. Type 4 - Concealed Bedding Conditions: One-part butyl-rubber calk conforming to FS TT-S-001657, Type I; Pecora "BC158," or equal.

H. Type 5 - Exterior and Interior Small to Medium Width Horizontal Joints Subject to Pedestrian Traffic: One-part, self-leveling polyurethane conforming to ASTM C920, Class 25, Type S, Grade P; Pecora " NR-201,” or equal.

I. Type 6 - Interior Nonwet Areas: One-component acrylic latex water-based sealant conforming to ASTM C834; Tremco "Acrylic Latex," or equal.

J. Type 7 - Interior Wet Areas: One-part mildew-resistant silicone rubber conforming to ASTM C920, Type S, Class 25, Grade NS; Dow Corning "786," or equal.

2.2 MISCELLANEOUS SEALANT MATERIALS

A. Paving Joint Backing for Interior Use: Preformed, self-expanding cork complying with ASTM D1752, Type III, or as recommended by paving sealant manufacturer.

B. Fiber Expansion Joint Material for Exterior Use: Preformed cellular fiber complying with ASTM D1751; 1/2 inch thick unless otherwise indicated; "SealTight Fiber Expansion Joint Filler" by W.R. Meadows or equal.

C. Perimeter Gap Sealant: Gun-dispensed, foam polyurethane or polyisocyanurate type conforming to ASTM C1620; Hilti “CF 810/812,” or equal.

D. Additional Sealant Materials: As specified in other Specification Sections.

2.3 SEALANT ACCESSORIES

A. Joint Primer/Sealer: As recommended by sealant manufacturer for joint surfaces to be primed or sealed.

B. Sealant Backer Rod: Compressible, rod-stock, polyethylene foam; nongassing, polyethylene-jacketed polyurethane foam; butyl-rubber foam; neoprene foam; or other flexible, permanent, durable, nonabsorptive, closed-cell material as recommended for compatibility with sealant by sealant manufacturer and complying with ASTM C1330.

C. Cleaner for Nonporous Surfaces: Nonstaining chemical cleaner acceptable to manufacturer of sealer and backing materials, harmless to substrates and adjacent nonporous materials.

D. Masking Tape: Nonstaining, nonabsorbent, compatible with joint sealants and adjacent surfaces.

E. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer. Provide self-adhesive tape where applicable.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that joint dimensions are not less than or greater than recommended by joint sealer manufacturer for application indicated.

B. Clean joint surfaces immediately before installation of sealant.
   1. Remove dirt, insecure coatings, moisture, and other substances that would interfere with bond of sealant.
   2. Etch concrete joint surfaces as recommended by sealant manufacturer.
   3. Use cleaning solvent to clean all joint surfaces.
   4. Wipe joints free of solvent, using clean, dry cotton cloths or lintless paper.
   5. Do not permit solvent to air dry.

3.2 INSTALLATION

A. General:
   1. Comply with manufacturer's printed instructions, except where more stringent requirements are shown or specified.
   2. Comply with ASTM C1193 for installation of elastomeric joint sealants.

B. Prime or seal joint surfaces as recommended by sealant manufacturer.
   1. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.
   2. Prime anodized aluminum and painted surfaces using primer recommended by sealant manufacturer, unless sealant manufacturer certifies in writing, that primer is not required.

C. Install sealant backer rod for elastomeric sealants, except where recommended to be omitted by sealant manufacturer for application shown.

D. Install bond-breaker tape wherever backer rod is not used and wherever required by manufacturer's recommendations to ensure that elastomeric sealants will perform properly.

E. Use only proven installation techniques that will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides.
   1. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces.
   2. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.

F. Install sealants to depths as recommended by sealant manufacturer, but within following general limitations:
   1. For walkways, floor and similar joints subject to traffic, and other abrasion and indentation exposures, fill joints to a depth equal to 75 percent of joint width but not more than 3/4 inch deep or less than 3/8 inch deep.
   2. For joints not subject to traffic, fill joints to a depth equal to 50 percent of joint width but not more than 1/2 inch deep or less than 1/4 inch deep.

3.3 CLEANING AND CURING

A. Clean adjoining surfaces to eliminate excess sealant.

B. Cure sealants in compliance with manufacturer's instructions and recommendations to obtain high early-bond strength, internal cohesive strength, and surface durability.

END OF SECTION 07 92 00

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Interior hollow metal doors and frames.

B. Related Requirements:
   1. Wood Doors: Section 08 14 00.
   2. Door Hardware: Section 08 71 00.
   3. Glazing: Section 08 80 00.
   4. Painting and Coating: Section 09 90 00.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
   3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

B. Coordination and Scheduling:
   1. Preparation includes sinkages and cutouts for mortise and concealed hardware.
   2. Hardware supplier shall furnish steel door and frame manufacturer with accepted hardware schedule, hardware templates, and samples of physical hardware where necessary to ensure correct fitting and installation.

1.3 SUBMITTALS

A. Metal Door Work Summary: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.
   1. Cover each type of door, frame, and frame condition.
   2. Include the following specific information:
      a. Elevation of doors and frames.
      b. Jamb and head details.
      c. Hardware preparation locations and reinforcing details of doors and frames.
      d. Complete door and frame descriptive nomenclature.
      e. Material description and gages.
      f. Methods of anchorage.
   3. Use same reference numbers for details and openings as those indicated on Drawings.

B. Product Data: Manufacturer's technical data substantiating that products comply with requirements.

C. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 4:
         1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
         2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
         3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
      b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

D. Furnish UL Certificates of Inspection for each assembly that exceeds size that can be labeled. Certificates shall verify that construction is identical to labeled assemblies. However, if labeled assemblies in scheduled sizes can be obtained from any source, no consideration will be given to manufacturers who are not UL authorized to fabricate and label such assemblies.

1.4 QUALITY ASSURANCE

A. Steel doors and frames shall comply with ANSI A250.8.

B. Work shall meet applicable requirements of the Hollow Metal Manufacturers Association (HMMA), a Division of the National Association of Architectural Metal Manufacturers (NAAMM).

C. Fire-Rated Assemblies: Wherever a fire-resistance classification is indicated, provide fire-rated steel doors and frames, investigated and tested as part of a fire [door] assembly, complete with type of fire door hardware to be used.
   1. Identify each fire-rated door and frame with permanent, metal labels, in accordance with NFPA Standard 252 and CBC, from approved testing and inspection agency, indicating applicable fire rating.

2. Construct and install assemblies in such a manner as to comply with NFPA Standard No. 80 and as specified herein.
3. Pairs of doors with vertical-rod panic exit devices, if applicable, shall be labeled without use of overlapping astragals.
4. Exit doors in an exit enclosure shall also have a maximum transmitted temperature end point not to exceed 450 degrees F (232 degrees C) above ambient at the end of 30 minutes of fire exposure when tested in accordance with CBC requirements.

1.5 PRODUCT HANDLING

A. Deliver doors and frames and other work of this Section properly tagged and identified.

B. Protection:
1. Deliver, store and handle all metal doors and frames in a manner to prevent damage and deterioration.
2. Provide packaging, separators, banding, spreaders, and individual wrappings as required to completely protect all metal doors and frames during transportation and storage.
3. Store doors upright, in a protected dry area, at least 1 inch off the ground and with at least 1/4 inch air space between individual pieces; protect all prefinished and hardware surfaces as required.

C. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

1.6 FIELD CONDITIONS

A. Post-Set Frames: Prepared openings shall be properly located and sized, plumb and square. Do not force-fit frames into improperly constructed openings.

B. Preset Frames: Wall/partition and frame locations shall be accurately marked before frames are erected.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Steel Doors and Frames: Ceco, Steelcraft, Security Metal Products, or equal manufacturer who is a member of the Hollow Metal Manufacturers Association (HMMA), Chicago, IL, 312-332-0405.

2.2 MATERIALS

A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A568 and ASTM A1011.

B. Cold-Rolled Steel Sheets: Commercial-quality carbon steel complying with ASTM A568 and A1008, exposed, matte finish, oiled.

C. Galvanized Steel Sheets: Commercial-quality zinc-coated carbon steel complying with ASTM A653 with A60 or G60 zinc coating.

D. Supports and Anchors: Fabricated of not less than 18-gage galvanized sheet steel.

E. Inserts, Bolts, and Fasteners: Manufacturer's standard units.

F. Shop-Applied Paint: Rust-inhibitive primer, either air dried or baked on, suitable as a base for specified finish paints.

2.3 FABRICATION - GENERAL

A. Conform to requirements of SDI or NAAMM.

B. Fabricate hollow metal units to be rigid, neat in appearance and free from defects, warp or buckle. Accurately form metal to required sizes and profiles. Weld exposed joints continuously, grind, dress, and make smooth, flush and invisible. Metallic filler to conceal manufacturing defects is not acceptable.

C. Fabricate steel doors and frames to required profiles and sizes by forming with edges straight and sharp.

D. Fit and fabricate accurately with corner hairline joints and all surfaces free from warp, wave, buckle, and other defects.

E. Welding: In accordance with AWS standards for high-grade hollow metal work
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain complete fusion without discontinuity or undercut.
   2. Remove weld spatter, oxides, and flux.
   3. Grind exposed welds smooth.

F. Fabricate exposed faces of doors only from cold-rolled steel.

G. Fabricate frames from either cold-rolled or hot-rolled steel (at fabricator's option).

H. Unless otherwise indicated, provide countersunk flat Phillips or Jackson heads for exposed screws and bolts.

I. Shop Painting:
   1. After fabrication, thoroughly clean surfaces of mill scale, rust, oil, grease, dirt, and other foreign matter, and chemically treat with phosphate compound so as to assure maximum paint adhesion.
   2. After pre-treatment of galvanized metal, apply shop coat of specified primer of even consistency in order to provide a uniformly finished surface, ready to receive finish painting.
   3. Finish shall comply with ANSI/SDI A250.10.
   4. Provide different colored shop primer to differentiate galvanized from non-galvanized products when delivered to Project site.

2.4 STEEL FRAMES

A. Gauges: In accordance with SDI recommendations for the door Grade specified.
   1. Frames in Openings 4'-0" or Less in Width: 16 gauge unless thicker gage is included in UL test procedure for rated frames.
   2. Frames in Openings over 4'-0" in Width: 14 gauge.
   3. Label Frames: 14 gauge or as included in UL test procedure.

B. Design and Construction:
   1. Frames shall be custom made welded units with integral trim and backbends, of the sizes and shapes shown on approved shop drawings. Knocked-down frames will be considered in locations where welded frames cannot be used, if approved in writing by County's Representative.
   2. Finished work shall be strong and rigid, neat in appearance, square, true and free of defects, warp or buckle. Bent members shall be clean cut, straight and of uniform profile throughout their lengths.
   3. Jamb depths, trim, profile and backbends shall be as shown on Drawings.
   4. Corner joints shall have all contact edges closed tight, with trim faces mitered and continuously back welded, and stops mitered. Unless otherwise noted, the use of gussets will not be permitted.
   5. Minimum depth of stops shall be 5/8 inch unless otherwise noted. Drill stops for silencers; three in strike stops for single swing doors, two in head stops for double swing doors.
   6. Frames for multiple or special openings shall have mullion and/or rail members which are closed tubular shapes having no visible seams or joints. All joints between faces of abutting members shall be securely welded and finished smooth.
   7. Profile bottom of jamb to contour of concrete at change in floor elevation occurring within jamb width.
   8. Field Joints:
      a. Limit field joints to large, multi-opening frames, to meet shipping and field conditions. Make field joints in concealed and/or inconspicuous locations.
      b. Weld-in concealed splice plates to match profiles of joined pieces. Make joints clean and flush, with required edge clearances at relief joints and tight contact edges elsewhere. Secure rigid joints with countersunk flathead machine screws, driven through rabbets.

9. Hardware Reinforcements:
    a. Frames shall be mortised, reinforced, drilled and tapped at the factory for fully templated mortised hardware only, in accord with approved hardware schedule and templates provided by the hardware supplier. Where surface mounted hardware is to be applied, frames shall have reinforcing plates.
    b. Minimum thickness of hardware reinforcing plates shall be 12 gauge.
10. Floor Anchors:
    a. Floor anchors shall be securely welded inside each jamb for floor anchorage.
    b. Where required, provide adjustable floor anchors, providing not less than 2 inch height adjustment.
    c. Minimum thickness of floor anchors shall be 14 gauge.
11. Jamb Anchors:
    a. Frames for installation in stud partitions shall be provided with steel anchors of suitable design, not less than 18 gauge thickness, securely welded inside each jamb as follows:
        1) Frames up to 7'-6" Height: 4 anchors.
        2) Frames 7'-6" to 8'-0· Height: 5 anchors.
        3) Frames over 8'-0" Height: 5 anchors plus one additional for each 2 feet or fraction thereof over 8'-0".
    b. Frames to be anchored to previously placed concrete shall be provided with minimum 3/8 inch concealed bolts set into expansion shields or inserts at 6 inches from top and bottom and 24 inches on center. Reinforce frames at anchor locations with 16 gauge sheet steel stiffeners welded to frame at each anchor.
12. Dust cover boxes (or mortar guards) of not thinner than 26 gauge steel shall be provided at all hardware mortises on frames to be set in plaster partitions.
13. Frames shall be provided with a steel spreader temporarily attached to the feet of both jambs to serve as a brace during shipping and handling.
14. Loose glazing stops shall be of cold rolled steel, not less than 20 gauge thickness, butted at corner joints and se cured to the frame with countersunk cadmium or zinc-plated screws. Interior frames may be provided with snap-on glazing stops.

2.5 HOLLOW METAL DOORS

A. ANSI/SDI Classification:
    1. Interior Non-Fire-Rated: Level 2 and Performance Level B, Model 2, heavy-duty seamless construction.
        a. Face sheets shall be minimum 0.042 inches (18 gage).
        b. Core: Honeycomb or polystyrene, laminated to the inside of both face sheets.
    2. Interior Fire-Rated: Level 2, Model 2, seamless composite construction.
        a. Face sheets shall be 18-gage unless otherwise required for required rating.
        b. Core: Mineral fiber or as standard with manufacturer to meet scheduled fire rating.
        c. Rating: As scheduled.

B. Design and Construction: In addition to requirements of the specified ANSI/SDI Classification, doors shall comply with the following.
   1. Doors shall be custom made, of the types and sizes shown on the approved shop drawings, and shall be fully welded seamless construction with no visible seams or joints on their faces or vertical edges. Minimum door thickness shall be 1-3/4 inches.
   2. Doors shall be strong, rigid and neat in appearance, free from warpage or buckles. Corner bends shall be true and straight and of minimum radius for the gauge of metal used.
   3. Face sheets shall be stiffened by continuous vertical formed steel sections spanning the full thickness of the interior space between door faces. These stiffeners shall be not less than 22 gauge spaced not more than 6 inches apart and securely attached to face sheets by spot welds not more than 5 inches on center. Spaces between stiffeners shall be sound-deadened and thermal insulated the full height of the door with an inorganic non-combustible batt-type material.
   4. Door faces shall be joined at their vertical edges by a continuous weld extending the full height of the door. Welds shall be ground, filled and dressed to make them invisible and provide a smooth flush surface.
   5. Top and bottom edges of all doors shall be closed with a continuous recessed steel channel not less than 16 gauge, extending the full width of the door and spot welded to both faces. Edge profiles shall be provided on both vertical edges of doors as follows:
      a. Single-acting swing doors: Beveled 1/8" in 2 inches.
      b. Double acting swing doors: Rounded on 2-1/8" radius.

C. Hardware Reinforcements: Comply with ANSI/SDI A250.6 and the following additional requirements.
   1. Doors shall be mortised, reinforced, drilled and tapped at the factory for fully templated hardware only in accord with the approved hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware (or hardware, the interrelation of which is to be adjusted upon installation - such as top and bottom pivots, floor closers, etc.) is to be applied, doors shall have reinforcing plates.
   2. Minimum gauges for hardware reinforcing plates shall be as follows:
      a. Hinge and Pivot Reinforcement: 7 gauge.
      b. Reinforcement for Lock Face, Flush Bolts, Concealed Holders, Concealed or Surface Mounted Closers: 12 gauge.
      c. Reinforcements for All Other Surface Mounted Hardware: 16 gauge.
   3. Louvers shall be full welded and factory installed.
   4. Glass Moldings and Stops:
      a. Where specified or scheduled, doors shall be provided with hollow metal moldings to secure glazing by others in accordance with glass opening sizes shown on drawings.
      b. Fixed moldings shall be securely welded to the door on the security side.

c. Loose stops shall be not less than 20 gauge steel, with mitered corner joints, secured to the framed opening by cadmium or zinc-coated countersunk screws space 8 inches on center. Snap-on attachments will not be permitted. Stops shall be flush with face of door.

D. Flatness: Doors shall maintain a flatness tolerance of 1/16 inch maximum, in any direction, including in a diagonal direction.

2.6 FINISH HARDWARE PREPARATION

A. Prepare hollow metal units to receive finish hardware, including cutouts, reinforcing, drilling and tapping in accordance with Finish Hardware Schedule and templates provided by hardware suppliers. Preparation includes sinkages and cut-outs for mortise and concealed hardware.

B. Comply with applicable requirements of ANSI/BHMA A156.115.

C. Locate finish hardware as shown on final shop drawings in accordance with locations noted herein.

D. Provide reinforcements for both concealed and surface applied hardware:
1. Drill and tap mortise reinforcements at factory, using templates.
2. Install reinforcements with concealed connections designed to develop full strength of reinforcements.

E. Reinforce steel doors and frames to receive surface-applied hardware
1. Drilling and tapping for surface-applied finish hardware shall be done at Project site by hardware installer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions where steel doors and frames are to be installed. Notify the County's Representative of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION OF FRAMES

A. Install frames in accordance with ANSI/SDI A250.11.

B. Install fire-rated frames in accordance with NFPA Standard No. 80.

C. Exercise care in setting of frames in order to maintain scheduled dimensions, hold head level, and maintain jambs plumb and square.

D. Secure anchorages and connections to adjacent construction.

1. Anchors shall be furnished to suit wall conditions and floor angles or clips welded to frame for fastening to floor.

E. Wherever possible, leave frame spreader bars intact until frames are set perfectly square and plumb and anchors are securely attached. Do not use shipping bars as spreaders.

F. Allow for expansion movement as required.

3.3 INSTALLATION OF DOORS

A. Install steel doors in accordance with manufacturer's instructions and Project requirements.

B. Place fire-rated doors with clearances as specified in NFPA Standard No. 80.

C. Do not erect members that are observed to be warped, bowed, deformed, or otherwise damaged or defaced to such extent as to impair strength or appearance. Remove and replace members that have been damaged in process of erection.

D. Apply hardware in accordance with requirements specified in Section 08 71 00 Door Hardware.

E. Adjust operable parts for correct function.

3.4 ADJUST AND CLEAN

A. Prime Coat Touch-up: Immediately after erection, items with damaged prime coat shall be sanded smooth and touched up with same primer as applied at shop.
   1. Remove rust before above-specified touch-up is applied.
   2. Touch-up shall not be obvious after application of finish coats.

B. Final Adjustments: Check and readjust operating finish hardware items, leaving steel items undamaged and in complete and proper operating condition.

C. Hollow metal frames or doors which are defective, have hardware cutouts of improper size or location, or which prevent proper installation of doors, hardware or work of other trades, shall be removed and replaced with new at no additional cost to County.

3.5 PROTECTION

A. Protect installed work against damage from other construction work and until ready to receive final finish painting as specified in Section 09 90 00 Painting and Coating.

END OF SECTION 08 11 13

SECTION 08 14 00

WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Solid core, flush interior wood doors with shop-applied plastic laminate finish.
   2. Factory preparation (premachining) for finish hardware.

B. Related Requirements:
   1. Hollow Metal Doors and Frames: Section 08 11 13.
   2. Door Hardware: Section 08 71 00; perimeter gaskets and door bottoms.
   3. Glazing: Section 08 80 00.
   4. Product and Finish Schedule: Appendix A.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
   3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

1.3 ACTION SUBMITTALS

A. Door Schedule: Include the following minimum requirements:
   1. Opening-identifying symbol. Use same identification as on Drawings.
   2. Location and sizes of each door.
   3. Door type and grade.
   4. Glazing.
   5. Face veneer and finish.
   6. Swing.
   7. Undercuts.

B. Product Data:
   1. Manufacturer's door specification indicating core and edge materials, veneer, and the following additional information usually provided as a shop drawing or Schedule:
      a. Opening-identifying symbol. Use same identification as Door Schedule on Drawings.
      b. Size.
      c. Swing.

d. Undercut.
e. Location and extent of any required hardware blocking.

2. Shop-applied laminate finish.

C. Sustainable Design (LEED):
1. General:
a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
b. Sustainable design submittals are in addition to other submittals.
c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
2. The following information shall be provided:
a. Credit MR 4:
1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.
c. Credit MR 6:
1) List of each FSC certified wood product on a line-item basis and noted as to whether each wood product is FSC Pure, FSC Mixed Credit, or FSC Mixed Percentage.
2) List of each wood product used on the project on a line item basis.
3) Vendor's invoices showing vendor's FSC Chain of Custody number.
4) Cut sheets for the FSC wood materials used on the project.
d. Credit MR 7: Certificates of chain-of-custody signed by millwork manufacturer certifying that wood products were obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria."
1) Include evidence that millwork manufacturer is certified for chain-of-custody by an FSC-accredited certification body.
2) Include statement indicating costs for each certified wood product.

D. Samples: Each type of door construction and face veneer, 12 inches square minimum, cut from corner of door, illustrating plastic laminate facing in selected color(s) and pattern(s).

1.4 CLOSEOUT SUBMITTALS

A. Warranty as specified.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain wood doors from single manufacturer.

B. Qualifications of Manufacturer:
   1. Qualified to affix each door with Seal of Acceptance or quality certification stamp from WI or AWI.
   2. Certified for chain of custody by an FSC-accredited certification body.

C. Fire-Rated Assemblies: Wherever a fire-resistance classification is indicated, provide fire-rated doors investigated and tested as part of a fire door assembly, complete with type of fire door hardware to be used.
   1. Identify each fire-rated door with a label from an approved laboratory indicating applicable fire rating and other specified requirements.
   2. Construct fire-rated doors in accordance with NFPA Standard 252.
   3. Install assemblies to comply with NFPA Standard No. 80.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Package doors at factory prior to shipping, using manufacturer's standard method.

B. Seal all four edges of site-finished doors after delivery if stored for more than 1 week at the Project site.

C. Label and identify doors for each opening to facilitate proper location using temporary, removable, or concealed markings. Correlate door identification with designation system used on shop drawings.

D. Store doors flat on level surface in clean, dry, and properly ventilated spaces. Do not expose doors to abnormal heat, dryness, and humidity.

E. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

1.7 WARRANTY

A. Manufacturer: Furnish to Owner door manufacturer's standard guaranty signed by manufacturer, installer, and Contractor, agreeing to repair or replace defective doors which warp (bow, cup, or twist), which show telegraphing of core construction in face veneers, or which do not conform to tolerance limitations of specified quality standards.

1. Include reinstallation if required owing to repair or replacement of defective doors where defect was not apparent prior to hanging.
2. Warranty Period: 5 years, minimum.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. Sustainable Design Requirements:
   1. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.
   2. Regional Materials: Wood doors shall be manufactured within 500 miles of Project.
   3. Certified Wood: Wood doors shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."

B. Quality Standard: In addition to requirements specified, doors shall be manufactured in accordance with Section 9 of the "Architectural Woodwork Standards (AWS)," published jointly by WI, AWI, and AWMAC, and referenced WDMA Standards where noted.

C. Allowable Tolerances for Fabrication of Doors: In accordance with referenced AWS standard.

2.2 MANUFACTURERS

A. Acceptable Manufacturers for Doors to Receive Laminate Finish: Member of WI, AWI or WDMA.

2.3 MATERIALS

A. Face Veneer at Flush Doors:
   1. Plastic Laminate: NEMA LD-3; Wilsonart Premium Laminate or equal.
      a. Type: General Purpose; except Fire rated at rated doors.
      b. Thickness: 0.125 inch.
      c. Finish and Pattern: Bamboo.
      d. Color: Asian Sun 7951K-18.

B. Adhesives: CS 171, Type II.

C. Vision Light Frames: 18-gage cold-rolled steel; Anemostat Model FGS-75; FP Series at rated doors, or equal.
   1. Rated frames shall bear fire rating label from approved testing laboratory.
   2. Finish: Manufacturer's standard pretreatment and primer; with factory finish to match door finish.

D. Glazing: 1/4 inch thick, clear tempered, as specified in Section 08 80 00 Glazing.

E. Edge and Cut Sealer: Compatible with specified paint finish.

2.4 FABRICATION - GENERAL

A. Conform to requirements of regulatory agencies, referenced AWS standard, reviewed shop drawings, and Contract Documents.

B. Prefit and premachine doors. Coordinate preparation of doors with hardware requirements specified in 08 71 00 Door Hardware.
   1. Premachine rated doors at factory by licensed fabricator for hardware requiring cutting of doors in compliance with NFPA 80.
   2. Factory-cut openings, insofar as practicable.
   3. Undercut doors where indicated or required by submittals.
   4. Seal raw edges immediately after cutting and fitting, including areas routed for hardware.

C. Provide the following door clearances, unless otherwise noted.
   1. Provide 1/16 inch at head and jambs.
   2. Provide 3/8 inch to finished floor at bottom where there is no threshold or carpet.
   3. Provide 1/8 inch at bottom to top of carpet or threshold.
   4. Provide 7/16-inch at bottom to top of threshold or floor finish where there is a door bottom seal. Modify clearance as required for specified seal.

2.5 FLUSH WOOD DOORS

A. Door Appearance Grade: Custom.

B. Performance Duty Level (WDMA): Heavy Duty.

C. Face Veneer: Laminate as specified.

D. Cross Banding: Hardwood veneer, 1/16 inch thick. Provide fire-retardant-treated cross banding on 90-minute rated doors.

E. Vertical Exposed Edges of Stiles:
   1. General: Solid stock, fire-retardant treated where required, hardwood with no finger joints, knots, pitch pockets, or other defects.
   2. Edge strips at laminate-faced doors shall be laminate to match door face.

F. Provide lock blocks to suit hardware for mineral-core doors; two 4-inch minimum (including stiles) width and 20-inch length.

G. Provide lock blocks to suit hardware for mineral-core fire-rated doors; two 5-inch minimum (including stiles) width and 10-inch length.

H. Sizes: As shown on the Drawings. Coordinate with installation to determine actual sizes and clearances.

I. Openings:
   1. Cut openings through doors as shown.
   2. Comply with the applicable requirements of referenced standards.
   3. Provide stops for openings as specified.

J. Cores: Solid; mineral core where required; 5-ply-type optional with manufacturer in accordance with WDMA Standard I.S. 1A.

K. Fire Rated Doors:
   1. Ratings: As scheduled on Drawings.
   2. Doors rated over 20 minutes shall be Type A with built-in intumescent seals.
   3. Provide 5-inch top and bottom rail for mineral-core doors.

2.6 FINISHING

A. General:
   1. Finishing shall conform to AWS "Premium" Grade requirements.
   2. Shop applied coatings shall be applied in accordance with manufacturer's written instructions.
   3. Transparent Finish: AWS System - 11, catalyzed polyurethane, or equal as standard with door manufacturer, in gloss level and color as selected by County's Representative.
      a. Provide factory finishing only; field finishing will not be permitted.

B. Preparation Requirements:
   1. Seal the top and bottom edges of all doors and around all cutouts with two coats of varnish or sealer before the hardware is set into place.
   2. All edges and factory-made cutouts shall be sealed before factory-installed hardware is set into place.

C. Edge and Cut Sealer: Compatible with specified painter's finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that doorframes are installed as required for proper installation of doors. Do not install doors in frames that would hinder door operation.

B. Do not install doors in frames which would hinder door operation.

C. Condition doors to average prevailing humidity in installation area prior to hanging.

3.2 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and requirements of AWS Standard.

B. Door Bevel:
   1. Nonrated Doors: Bevel 1/8 inch in 2 inches.
   2. Rated Doors: Bevel as permitted by labeling agency.

C. Install fire-rated doors in fire-rated frames in accordance with requirements of National Fire Protection Association (NFPA) Standard No. 80.

D. Hardware: For installation, see Section 08 71 00 Door Hardware.

E. Fit to frames and machine for hardware to whatever extent not previously worked at factory as required for proper fit and uniform clearance at each edge.

3.3 ADJUST AND CLEAN

A. Replace or rehang doors which are hinge bound and do not swing or operate freely.

B. Protect installed wood doors from damage or deterioration until acceptance of work.

C. Refinish or replace finished doors damaged during installation.

END OF SECTION 08 14 00

SECTION 08 31 00

ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Access doors and panels in walls and ceilings.

B. The requirements of this Section supplement those included in other Divisions.

C. Related Requirements:
1. Gypsum Board: Section 09 29 00.
2. Paints and Coatings: Section 09 90 00.
3. Plumbing: Division 22.
4. Heating, Ventilating, and Air-Conditioning: Division 23.
5. Electrical: Division 26.
6. Communications: Division 27.
7. Electronic Safety and Security: Division 28.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Indicate locations of required access doors and panels for review by County's Representative if not otherwise shown.

B. Product Data: Submit manufacturer's specifications and installation instructions.

C. Sustainable Design (LEED):
1. General:
a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
b. Sustainable design submittals are in addition to other submittals.
c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.

2. The following information shall be provided:
   a. Credit MR 4:
      1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
      2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
      3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
   b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

1.4 QUALITY ASSURANCE

A. Size Variations: Obtain acceptance by County's Representative of manufacturer's standard size units, which may vary slightly from sizes shown, scheduled, or specified in Divisions 22, 23, 26, 27 and 28.

B. Mockups: If requested by County's Representative, first installed example of each type of access door shall serve as a mockup.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Metal Access Doors:
   1. Basis of Design: J. L. Industries.
   2. Additional Acceptable Manufacturers: Karp Associates, Inc., Nystrom, Milcor, Jay R. Smith Manufacturing, or equal.

2.2 DESIGN AND PERFORMANCE CRITERIA

A. Access doors at acoustically rated conditions shall be insulated type.

B. Hinges shall allow for opening as required for access to utilities but not less than 90 degrees.

C. Size doors and panels to meet access and regulatory agency requirements but not less than 10 inches x 10 inches.

2.3 MATERIALS AND FABRICATION

A. Gypsum Board Partitions and Ceilings – Non-rated.
   1. Style: Flanged type for flush mounting with concealed frames.
   2. Frame: 16-gage galvanized steel with 1-inch wall frame, 1-5/8 inches deep.

3. Door: 16-gage steel.
4. Finish: Gray powder coat, factory applied.

B. Gypsum Board Tiled Partitions and Ceilings at Wet Areas- Non-rated: Stainless steel.
1. Trim Style: 1-inch wide, flush flange.
2. Frame: 16-gage.
3. Door: 14-gage.
4. Finish: AISI #4 satin.

C. Locks: Provide key-operated cylinder lock for each access door or panel in common areas unless non-keying is required by governing authorities or utility company.
1. Keying shall be in accordance with schedule provided by the County's Representative.
2. At access doors and panels without cylinder lock, provide screwdriver-operated lock.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that rough openings for door and frame are correctly sized and located.

B. Coordinate with other Sections to verify correct sizes and locations of access doors.

3.2 INSTALLATION

A. Comply with manufacturer's instructions for installation of access doors.

B. Set frames accurately in position. Securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.

C. Install in locations required to give access to plumbing, mechanical, electrical, or similar devices concealed in walls or ceilings, whether or not specifically indicated on the Drawings.

D. Conceal frames with tape and joint compound at painted gypsum board partitions as specified in Section 09 29 00 Gypsum Board.

E. Adjust hardware and doors after installation for proper operation.

END OF SECTION 08 31 00

SECTION 08 42 13

ALUMINUM-FRAMED ENTRANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Aluminum and glass exterior swing entrances.
2. Hardware for entrances.

B. Related Requirements:
1. Quality Control: Section 01 45 00.
2. All-Glass Entrances: Section 08 42 26; interior glass doors.
3. Aluminum-Framed Storefronts: Section 08 43 13.
4. Door Hardware: Section 08 71 00; pulls, cylinders, and additional hardware requirements.
5. Automatic Door Operators: Section 08 71 13.
6. Glazing: Section 08 80 00.
7. Electrical: Division 26.
8. Electronic Safety and Security: Division 28.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

B. Coordination:
1. Coordinate installation of aluminum entrances with aluminum-framed storefronts so as to produce a weatherproof and waterproof installation.
2. Coordinate with other applicable Sections for matching of general appearance, color, and finish of aluminum-framed glass work.
3. Doors and frames shall be fabricated and prepped to accommodate wiring and contacts of security system. Coordinate with security contractor. Retrofitting doors and frames in-place is not acceptable.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Show elevations, dimension, member profiles, details of interface with storefront framing, reinforcement, and glazing materials and methods.
1. Show deviations from Contract Documents.

2. Prepare drawings at 1/2-inch-to-1-foot scale for elevations and 3-inches-to-1-foot scale for details.
3. Indicate field measurements.
4. Manufacturer's standard drawings modified to show clearly that actual Project conditions and proposed work are acceptable.

B. Product Data: Submit for doors and hardware items provided by door manufacturer. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

C. Hardware Schedule:
1. Detailed hardware Groups/Sets for each opening shall be prepared by Contractor and submitted for aluminum-framed entrances.
2. Schedule shall be prepared under direct supervision of a member of the Door and Hardware Institute (DHI). Include verification of supervision on submittal.
3. Coordinate function requirements with the County's Representative prior to submission of Schedule.
4. Coordinate with the Hardware Schedule required under in Section 08 71 00 Door Hardware.
5. Review of Hardware Schedule shall not be construed as certifying that the list is complete.

D. Sustainable Design (LEED):
1. General:
   a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
   b. Sustainable design submittals are in addition to other submittals.
   c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
2. The following information shall be provided:
   a. Credit MR 4:
      1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
      2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
      3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
   b. Credit MR 5:
      1) Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

E. Samples: 12-inch-long section of typical stile extrusions in required width and with specified finish in selected color.

1.4 INFORMATIONAL SUBMITTALS

A. Verification of compliance with specified performance criteria if not included with Product Data submittal.

B. Statement of fabricator/installer qualifications, if requested by County's Representative.

1.5 CLOSEOUT SUBMITTALS

A. Extended Warranty.

1.6 QUALITY ASSURANCE

A. Fabricator/Installer Qualifications: Documented experience on jobs of similar type and complexity, and approved by manufacturer.

B. Comply with AAMA "Metal Curtain Wall, Window, Store Front and Entrance Guide Specifications Manual."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver fabricated units and component parts to Project site completely identified in accordance with numbering system used on shop drawings or erection diagrams.

B. Protect prefinished aluminum surfaces with wrapping or strippable coating. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather. Puncture wrappings at ends for ventilation.

C. Store inside building, protected from weather and from construction activities.

D. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

1.8 FIELD CONDITIONS

A. Field Measurements: Where entrances are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on shop drawings.
   1. Allow for trimming and fitting wherever taking of field measurements before fabrication might delay work.
   2. Coordinate fabrication schedule with construction progress to avoid construction delays.

B. Established Dimensions: Where field measurements cannot be made without delaying work, establish dimensions, and proceed with fabrication without field measurements. Coordinate with other construction to ensure that actual dimensions correspond to established dimensions.

C. Do not install sealants when ambient temperature is less than 40 degrees F.

1.9 WARRANTY

A. Contractor: Provide County with a written 5-year warranty agreeing to repair or replace work that fails in materials or workmanship.
   1. Failure includes:
      a. Glass breakage in excess of expected accidental breakage.
      b. Leakage or air infiltration in excess of specified requirements.
      c. Faulty operation of doors or hardware.
      d. Deterioration of finish or construction in excess of normal weathering.
      e. Defects in hardware, weatherstripping, and other components of the work.
   2. Warranty shall be signed by countersigned by manufacturer and installer.

B. Manufacturer: Insulating glass; as specified in Section 08 80 00 Glazing.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Swing Doors: NAAMM, Medium Stile, thermally broken; Kawneer or equal by Oldcastle BuildingEnvelope, Efco, or equal.
   1. Door Thickness: 1-3/4-inch.
   2. Bottom Rail: 10 inches.

2.2 SYSTEM CRITERIA

A. Provide entrances as part of a complete enclosure system which includes the following and complies with the performance requirements specified:
   1. Doors complete with glass and glazing.
   2. Anchors, fasteners, shims, and inserts as required to attach to structure and storefront.
   3. Finish hardware.

B. Performance Requirements:
   1. Resistance to corner racking shall be tested by the Dual Moment Load test as follows:
      a. Test section shall consist of a standard top door corner assembly. Side rail section shall be 24 inches long, and top rail section shall be 12 inches long.
      b. Anchor "top rail" positively to test bench so that corner protrudes beyond bench edge.

c. Anchor a lever arm positively to "side rail" at a point 19 inches from inside edge of "top rail." Attach weight support pad at a point 19 inches from inner edge of "side rail."
d. Test section shall withstand a load of 270 pounds on the lever arm before reaching the point of failure, which shall be considered a rotation of the lever arm in excess of 45 degrees.

2. Air Infiltration at Exterior Doors, ASTM E283:
   a. Single Doors: Maximum of 0.50 cfm/square feet of unit.
   b. Pairs of Doors: Maximum of 0.10 cfm/square feet of unit.
3. Expansion/Contraction: System shall provide for expansion and contraction within system components caused by a temperature range of 170 degrees F over a 12-hour period without causing detrimental effect to system components.

2.3 MATERIALS

A. Aluminum Extrusions: ASTM B221, alloy 6063-T5.

B. Fasteners: Aluminum, nonmagnetic, stainless steel or other materials which are non-corroding and compatible with aluminum components.
   1. Provide reinforcement where fasteners are screwed into aluminum members of less than 1/8-inch thickness.
   2. Do not use exposed fasteners.

C. Miscellaneous Concealed Metal Members: Aluminum or nonmagnetic stainless steel.

2.4 GLAZING

A. Glazing Gaskets: Full-Density EPDM conforming to NAAMM Standard SG-1.

B. Glazing Blocks, Spacers, and Accessories: As specified in Section 08 80 00 Glazing.

C. Glass: Clear, insulating at exterior units, tempered where required by code; as specified in Section 08 80 00 Glazing.

2.5 HARDWARE - GENERAL

A. Weatherstripping: Manufacturer's standard and optional bottom gasketing as required to meet specified performance requirements.

B. Keying and Additional Hardware Requirements for Each Opening: As specified in Section 08 71 00 Door Hardware and Section 08 71 13 Automatic Door Operators.

2.6 FABRICATION

A. General:
   1. Perform all finishing prior to shipping to Project.

2. Whenever it is necessary to proceed with fabrication without actual field measurements, provide adequate fabrication and installation tolerances for proper fit.
3. Maintain accurate relationships of planes and angles, with hairline fit of contacting members.
4. Perform fabrication operations, including cutting, fitting, forming, drilling, and grinding of metalwork in such a manner as to prevent damage to exposed finish surfaces.

B. Corner construction shall consist of mechanical clip fastening and SIGMA deep-penetration plug welds at top and bottom of channel clip.

C. Provide SIGMA fillet welds along both top and bottom webs of rail extrusion.

D. Thermal Barrier: Exterior aluminum shall be separated from interior aluminum by a rigid, structural thermal barrier.

2.7 FINISHES

A. Finish on Exposed Aluminum: Spray-applied, high-performance thermosetting fluoropolymer architectural powder coating meeting or exceeding AAMA 2604; PPG Industries "Envirocron Ultradurable," or equal with improved mar resistance and hardness.
1. Color: Custom metallic, as selected by County's Representative.
2. Coordinate with Section 08 43 13 Aluminum-Framed Storefronts for color and appearance match.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's instructions, drawings, specifications, and reviewed submittals. Erection shall be plumb, level, square, and in proper alignment and relationship to other work.

B. Glazing shall comply with requirements of Section 08 80 00 Glazing. Ensure proper seating of gaskets for continuous contact with glass around perimeter of glazed openings.

C. Adjust entrances for proper operation of each door and its mechanical hardware. Comply with additional hardware installation requirements specified in Section 08 71 00 Door Hardware and Section 08 71 13 Automatic Door Operators. Coordinate with Division 28 Electronic Safety and Security.

D. Finished work shall be free of waves, buckles, dents, or other defects.

3.2 FIELD QUALITY CONTROL

A. Upon completion of installation, a representative of storefront and entrance manufacturer shall inspect in order to verify that storefronts and aluminum-framed entrances have been installed in accordance with manufacturer's approved specifications and details.

B. County may hire an inspector and/or testing agency in accordance with Section 01 45 00 Quality Control.
   1. Inspector and/or testing agency will interpret tests and state in each report whether tested work complies with or deviates from specified requirements.

C. Correct deficiencies, and modify system installation methods and detailing as required at no additional cost to County. Retest to assure no leakage.

D. Remaining installation shall comply with procedures used on acceptable entrance.

3.3 CLEANING, PROTECTION, AND TOUCH-UP

A. Protect installation from damage by tools, plaster, lime, acid, cement, or other compounds.

B. Leave manufacturer's labels in place, intact, and legible until installation is reviewed and accepted. After initial inspection, remove labels, protective coating, and other foreign materials from glass and aluminum surfaces.

C. Clean glass and metalwork of smears, spots, and other markings.
   1. Use cleaning materials and methods recommended by window and door manufacturer for specified aluminum finish.
   2. Comply with additional requirements for final cleaning specified in Division 01.

D. Touch up field abrasions and damage to factory finish. Touch-up shall be unnoticeable in completed installation. Touch-up components determined as unacceptable by the County’s Representative. Components which cannot be successfully touched up shall be replaced at no additional cost to County.

END OF SECTION 08 42 13

SECTION 08 42 26

ALL-GLASS ENTRANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. All-glass entry doors and matching sidelights for interior installation.
2. Hardware for all-glass entry doors.

B. Related Requirements:
1. Decorative Metal: Section 05 70 00; Entry Structure to receive all-glass doors.
2. Aluminum-Framed Entrances: Section 08 42 13; exterior glazed entrances.
3. Aluminum-Framed Storefronts: Section 08 43 13.
4. Door Hardware: Section 08 71 00.
5. Automatic Door Operators: Section 08 71 13; automatic floor operators.
6. Glazing: Section 08 80 00.
7. Electrical: Division 26.
8. Electronic Safety and Security: Division 28.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

B. Coordination:
1. Coordinate with Section 05 70 00 decorative metal for installation of doors at Entry Structure.
2. Doors and frames shall be fabricated and prepped to accommodate wiring and contacts of security system. Coordinate with Division 28 Electronic Safety and Security. Retrofitting doors and frames in-place is not acceptable.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Indicate layouts, elevations, door swing, interior and exterior side, and details.

B. Product Data: Manufacturer's literature for components used in assemblies including exposed fasteners and fittings, glass, and door hardware. Hardware shall be keyed to specified Hardware Groups.

C. Hardware Schedule: Prepare and submit for each opening and include name of each item and its manufacturer, catalog number, material, and finish. Maintain same opening tags used on the Drawings.

D. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 4:
         1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
         2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
         3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
      b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

E. Samples:
   1. Fittings and Hardware: One sample of each item.
   2. Glass: Each Type as specified in Section 08 80 00 Glazing.

1.4 INFORMATIONAL SUBMITTALS

A. Statement of installer qualifications.

1.5 CLOSEOUT SUBMITTALS:

A. Extended warranty.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Approved by and under supervision of manufacturer, with not fewer than 5 years' experience installing doors of this type.

B. Doors shall comply with applicable standards for barrier-free access.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle components in manufacturer's standard protective packaging.

B. Store components off the ground, in a protected location.

C. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

1.8 WARRANTY

A. Manufacturer: Manufacturer's standard form in which manufacturer agrees to repair or replace components of all-glass door system, including operating hardware, that fails in materials or workmanship within 2 years.

PART 2 - PRODUCTS

2.1 SUSTAINABILITY REQUIREMENTS

A. Recycled Content: If no specific amount of recycled content is specified, materials with the highest feasible recycled content shall be purchased. Materials with recycled content shall document the cost and percentage of each material, broken out by post-industrial (pre-consumer) and post-consumer content.

B. Regional Content: Materials shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of the Project site.

2.2 ALL-GLASS DOORS

A. Manufacturer and System: “Series 1301” by Blumcraft of Pittsburgh, a Division of C.R. Laurence Co, Inc., or equal.

B. Door Style: Patch bottom and top fittings, stainless steel clad.
   1. Patch Rail Profile: Square.

C. Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), tested for surface and edge compression in accordance with ASTM C1048 and for impact strength in accordance with 16 CFR 1201 for Category II materials.
   1. Type: Transparent.
   2. Exposed Edges: Flat polished.
   3. Thickness: 3/4 inch.

2.3 HARDWARE

A. As specified in Section 08 71 00 Door Hardware and Section 08 71 13 Automatic Door Operators.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that conditions are satisfactory for installation of tempered-glass doors and sidelights.

3.2 INSTALLATION

A. Install doors and sidelights in accordance with manufacturer's instructions and accepted shop drawings. Adjust door to operate smoothly.

B. When complete:
   1. Doors shall be set square, plumb, and level.
   2. Abutting edges of glass panels shall align within acceptable glass fabrication tolerances.
   3. Doors shall remain plumb during swing and shall operate smoothly, quietly, and free from binding. Adjust closers to meet maximum closure pressure required by ADA.
   4. Exposed surfaces shall be free from scratches, dents, tool marks, stains, discoloration, and other damage and defects.

3.3 CLEANING

A. Following completion of installation, clean both metal and glass surfaces of excess sealants, paint, and other adhering foreign materials. Use cleaning materials and procedures recommended by door manufacturer.

B. Comply with additional requirements for final cleaning specified in Division 01.

END OF SECTION 08 42 26

SECTION 08 43 13

ALUMINUM-FRAMED STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Aluminum framing system for exterior and interior storefronts, transoms, and fixed glass windows where scheduled.

B. Related Requirements:
1. Metal Fabrications: Section 05 50 00; fabricated steel attachment devices.
2. Sheet Metal Flashing and Trim: Section 07 62 00; subsill flashing.
3. Flexible Flashing and Underlayment: Section 07 65 00; flashing at perimeter of window and door openings.
4. Joint Sealants: Section 07 92 00; requirements for system perimeter sealant and backup materials.
5. Aluminum-Framed Entrances: Section 08 42 13; exterior glazed entrances.
6. All-Glass Entrances: Section 08 42 26; interior glazed entrances.
7. Door Hardware: Section 08 71 00.
8. Automatic Door Operators: Section 08 71 13.
9. Glazing: Section 08 80 00; requirements for system glass, glazing, glazing gaskets and sealants.
10. Demountable Wall System: Section 10 22 19; interior glazed partitions as shown.
11. Electrical: Division 26.
12. Electronic Safety and Security: Division 28.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

B. Coordination:
1. Coordinate installation of storefronts with sealant and glazing work to produce a weatherproof and waterproof installation.
2. Coordinate construction and installation of storefront system with other work having a direct bearing on work of this Section. Where applicable, furnish setting templates and layouts affecting work of other Sections.
3. Coordinate with other applicable Sections for matching of general appearance, color, and finish of aluminum-framed glass work.

4. Doors and frames shall be fabricated and prepped to accommodate wiring and contacts of security system. Coordinate with Division 28 Electronic Safety and Security. Retrofitting doors and frames in-place is not acceptable.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Show elevations, dimension, member profiles, details of composite members, details of interface with other building construction, reinforcement, expansion provisions, method and location of attachment to structural system, and glazing materials and methods.
   1. Show deviations from Contract Documents.
   2. Prepare drawings at 1/2-inch-to-1-foot scale for elevations and 3-inches-to-1-foot scale for details.
   3. Indicate field measurements.

B. Product Data: Manufacturer's standard details for system components, performance data, finish, and installation instructions. Clearly indicate deviations from specified or shown requirements.

C. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 4:
         1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
         2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
         3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
      b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

D. Samples:
   1. Glass: As required by Section 08 80 00 Glazing.
   2. Specified finish for framing members on 6-inch-long section of mullion extrusion.

1.4 INFORMATIONAL SUBMITTALS

A. Statement of fabricator/installer qualifications.

B. Delegated-Design Services: Design calculations by design engineer to demonstrate storefront system is in compliance with specified seismic and structural requirements if not indicated on product data submittal.

1.5 CLOSEOUT SUBMITTALS

A. Extended warranty.

1.6 QUALITY ASSURANCE

A. Design engineer shall be a structural or civil engineer registered in the State of California.

B. Fabricator/Installer Qualifications: Company specializing in work of this Section, with documented experience on jobs of similar type and complexity, and approved by manufacturer.

C. Comply with AAMA SFM-1, "Aluminum Storefront and Entrance Manual."

D. Product Standard: Storefront shall meet or exceed the following Performance Class and Grade requirements of AAMA/WDMA/CSA 101/I.S.2/A440NAFS - North American Fenestration Standard/Specification for windows, doors, and skylights."
   1. Performance Class: HC (Heavy Commercial).
   2. Minimum Performance Grade: 60.

E. Mockups: First installed example of each type of storefront, transom, or fixed glass window, and each installation condition shall serve as a mockup for review and acceptance by County's Representative of workmanship, visual effect, and interface with adjacent construction.
   1. Exterior mockups may be subject to informal water testing.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver fabricated units and component parts to Project site, completely identified in accordance with numbering system used on shop drawings or erection diagrams.

B. Protect prefinished aluminum surfaces with wrapping or strippable coating. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather. Puncture wrappings at ends for ventilation.

C. Store inside building, protected from weather and from construction activities.

D. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

1.8 FIELD CONDITIONS

A. Field Measurements: Where storefronts are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on shop drawings.
   1. Allow for trimming and fitting wherever taking of field measurements before fabrication might delay work.
   2. Coordinate fabrication schedule with construction progress to avoid construction delays.

B. Established Dimensions: Where field measurements cannot be made without delaying work, establish dimensions, and proceed with fabrication without field measurements. Coordinate with other construction to ensure that actual dimensions correspond to established dimensions.

C. Do not install sealants when ambient temperature is less than 40 degrees F.

1.9 WARRANTY

A. Storefront System: Provide manufacturer's written 2-year warranty agreeing to repair or replace work that fails in materials or workmanship. Failure includes failure to perform as specified and/or deterioration of finish or construction in excess of that to be expected under normal weathering.

B. Warranty for Insulating Glass: As specified in Section 08 80 00 Glazing.

PART 2 - PRODUCTS

2.1 STOREFRONT SYSTEM

A. Manufacturer and Product: "Trifab 451T" by Kawneer, or equal by Efco, Oldcastle BuildingEnvelope, or equal.
   1. Mullions: 2 inch sightline by 4 inches deep.
   2. Glazing: Captured, vertical and horizontal.

2.2 PERFORMANCE REQUIREMENTS

A. Air Infiltration at Exterior Units: Limit air infiltration through assembly to 0.06 cfm per square foot of wall area, measured at a reference differential pressure across assembly of 6.24 psf when tested in accordance with ASTM E283.

B. Seismic Provisions: Provide reinforcing to resist deflection and vertical and lateral forces as required by the CBC and in accordance with AAMA seismic testing.

C. Uniform Loading:
   1. Maximum deflection 1/175 of span or 3/4 inch, whichever is less, with no evidence of permanent deformation or damage using a safety factory of 1.65 when tested in accordance with ASTM E330.
   2. Design pressure shall be as noted on the Structural Drawings.

D. Dead Load of Glass:
   1. Design to avoid deflection in horizontal frame members that could impact glass below frame.
   2. System shall not deflect more than 1/8-inch at the center point, or 1/16 inch at the center point of a horizontal member, once deadload points have been established.

E. Water Leakage at Exterior Units:
   1. Static Pressure: None, when subjected to subjected to laboratory testing in accordance with ASTM E331 at not less than 12 psf.
   2. Dynamic Pressure: None, when subjected to laboratory testing in accordance with AAMA 501.1 at not less than 12 psf.

F. Expansion/Contraction: System shall provide for expansion and contraction within system components caused by a temperature range of 180 degrees F over a 12-hour period without causing detrimental effect to system components.

G. Labels: At exterior units, apply label indicating U-value in conformance with California Energy Commission Section 116 requirements and indicating compliance with requirements of AAMA 101. Testing for thermal resistance ratings shall be by an approved testing laboratory in accordance with the National Fenestration Rating Council (NFRC).

2.3 MATERIALS

A. Metal Framing:
   1. Extruded Aluminum: ASTM B221, 6063-T6 alloy and temper, size, and shape as required by design criteria but not less than 0.125 inch thick.
   2. Sheet Aluminum: ASTM B209. Aluminum sheet for formed members shall be not less than 0.05 inch thick.
   3. Fasteners, Anchors, Embeds, and Miscellaneous Fastening Devices: Concealed type; aluminum, stainless steel, or other noncorrosive material compatible with aluminum.
   4. Coating for Separation of Dissimilar Metals: Cold-applied asphalt mastic, zinc chromate paint, or other nonconductive, non-absorptive material.

B. Glass And Glazing:
   1. General: Materials shall achieve weather, moisture, and air infiltration requirements and comply with requirements of Section 08 80 00 Glazing.
   2. Glass: Clear, insulating at exterior units, tempered where required by code; as specified in Section 08 80 00 Glazing.
   3. Gaskets: Elastomeric, as recommended or provided by system manufacturer.

C. Sealants:
   1. General:
      a. Use materials and application procedures as recommended by manufacturer. Seal joinery, fastener penetrations, and welds as required for watertight installation. Sealant on exposed finished surfaces will not be permitted.
      b. Use only non-hardening, non-shrinking, and non-migrating materials.
      c. For nonworking metal-to-metal joints within framing members, use small-joint sealant conforming to 803.3 as described in AAMA 800.
   2. Preparation: Clean and prime substrate surfaces in accordance with manufacturer's recommendations.
   3. Application: Tool all sealant applications. Tape and tool exposed sealant applications. Where permitted, tool exposed sealant applications flush or as otherwise directed, with no excess sealant on exposed finished surfaces.
   4. Perimeter sealants and additional sealant requirements are specified in Section 07 92 00 Joint Sealants.

D. Other Components:
   1. Flashings: Aluminum, finish to match storefront sections where exposed. Secure with concealed fastening methods.
   2. Perimeter Flashing: Self-adhesive flashing as specified in Section 07 65 00 Flexible Flashing and Underlayment.
   3. Slip-Joint Accessories: Pads, sheets, shims, or washers that allow free movement and prevent corrosion "freeze-up."
   4. Concealed Flashing: Dead-soft stainless steel, 26 gage minimum; extruded aluminum, 0.062 inch minimum; or an alloy and type selected by manufacturer for compatibility with other components.
   5. Miscellaneous Concealed Metal Members: Aluminum or nonmagnetic stainless steel. Members that are not exposed to weather or abrasion may be steel complying with the specified protective coating requirements.

2.4 FABRICATION

A. General:
   1. Perform all finishing prior to shipping to Project.
   2. When it is necessary to proceed with fabrication without actual field measurements, provide adequate fabrication and installation tolerances for proper fit.
   3. Maintain accurate relationships of planes and angles, with hairline fit of contacting members.
   4. Perform fabrication operations, including cutting, fitting, forming, drilling, and grinding of metalwork in manner that prevents damage to exposed finish surfaces.
   5. Wall thickness of framing members shall be as required for systems to meet specified performance criteria for height at each location while maintaining indicated profile dimensions. Internal supplemental steel reinforcing, if required, shall be indicated on submittals and shall be galvanized.

B. Members shall include extruded-aluminum gutter lugs, aluminum or stainless-steel spring face clips, screws, and metal setting blocks with lead pads. Gutter screws shall not be in contact with glass.

C. Framing shall be accurately assembled, with no exposed fasteners, utilizing extruded splines, shear blocks, and/or snap-in features.

D. Integral Base, Exposed Flashings, and Trim: Brake-formed aluminum, finish to match storefront wall mullion sections, secured with concealed fastening method.

2.5 PROTECTIVE COATINGS AND FINISHES

A. General:
   1. Perform all finishing prior to shipping to Project site.
   2. Protect against galvanic action where dissimilar metals are in contact, except in case of aluminum in contact with galvanized steel, zinc, or relatively small areas of stainless steel or nickel silver (white bronze). Protect by applying one coat of specified bituminous paint or zinc chromate primer or by application of an appropriate sealant or tape.

B. Finish on Exposed Aluminum: Spray-applied, high-performance thermosetting fluoropolymer architectural powder coating meeting or exceeding AAMA 2604; PPG Industries "Envirocron Ultradurable," or equal with improved mar resistance and hardness.
   1. Color(s): Custom metallic, to be selected by County's Representative.
      a. Two colors may be required, a darker color for exterior surfaces and a lighter color for interior surfaces.

PART 3 - EXECUTION

3.1 PREPARATION

A. Separate aluminum from dissimilar metals.

B. Coat dissimilar metals in drainage cavities, using specified material. Aluminum, stainless steel, zinc, cadmium, and small areas of white bronze are not considered dissimilar from each other.

C. Coat all metals that come into contact with masonry, concrete, cement plaster, and treated wood, using specified material.

D. Galvanized Steel: Clean and touch up welds, bolted connections, and abraded areas in accordance with ASTM A780, using galvanizing-repair paint.

3.2 INSTALLATION

A. Comply with manufacturer's instructions, drawings, specifications, and reviewed submittals. Erection shall be plumb, level, square, and in proper alignment and relationship to other work.

B. Anchor securely to surrounding construction as detailed and required.

C. Finished aluminum work shall be free of waves, buckles, dents, or other defects.

D. Moldings joined at corners shall be accurately cut and neatly fitted to result in a tightly closed miter.

E. Install glass in accordance with Section 08 80 00 Glazing and manufacturer's instructions to achieve performance criteria. Ensure proper seating of gaskets for continuous contact with glass around perimeter of glazed openings.

F. Sealants:
   1. Apply in accordance with sealant manufacturer's written recommendations.
   2. Install perimeter sealant by method required to achieve performance criteria. Type, backing materials, and installation criteria shall be in accordance with Section 07 92 00 Joint Sealants.
   3. Give special attention to proper cleaning of aluminum surfaces in contact with sealant.

3.3 FIELD QUALITY CONTROL

A. Upon completion of installation, a representative of storefront manufacturer shall inspect in order to verify that storefronts and aluminum-framed entrances have been installed in accordance with manufacturer's approved specifications and details.

B. In addition, County may hire an inspector and/or testing agency in accordance with Section 01 45 00 Quality Control and other provisions of Division 01.
   1. Inspector and/or testing agency will interpret tests and state in each report whether tested work complies with or deviates from specified requirements.

C. Correct deficiencies, and modify system installation methods and detailing as required at no additional cost to County. Retest to assure no leakage.

D. Remaining installation shall comply with procedures used on acceptable storefront.

3.4 CLEANING, PROTECTION, AND TOUCH-UP

A. Protect installation from damage by tools, plaster, lime, acid, cement, or other compounds.

B. Leave manufacturer's labels in place, intact, and legible until installation is reviewed and accepted. After initial inspection, remove labels, protective coating, and other foreign materials from glass and aluminum surfaces.

C. Clean glass and metalwork of smears, spots, and other markings.
   1. Use cleaning materials and methods recommended by window and door manufacturer for specified aluminum finish.
   2. Comply with additional requirements for final cleaning specified in Division 01.

D. Touch up field abrasions and damage to factory finish.
   1. Touch-up shall be unnoticeable in completed installation.
   2. Touch-up components determined as unacceptable by County's Representative.
   3. Components which cannot be successfully touched up shall be replaced at no additional cost to the County.

END OF SECTION 08 43 13

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Finish hardware for doors.

B. Related Requirements:
1. Architectural Wood Casework, Section 06 41 00; cabinetwork hardware.
2. Hollow Metal Doors and Frames: Section 08 11 13.
3. Wood Doors: Section 08 14 00.
4. All-Glass Entrances: Section 08 42 26; entrance door hardware.
5. Aluminum-Framed Storefronts: Section 08 43 13.
6. Automatic Door Operators: Section 08 71 13; automatic floor operators.
7. Chain Link Partition and Gate: Section 10 22 10.
8. Demountable Wall System: Section 10 22 19; hardware for demountable wall system.
9. Toilet Accessories: Section 10 28 13.
10. Electrical: Division 26.
11. Electronic Safety and Security: Division 28.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
3. Maintenance Material Submittals and Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

B. Pre-Installation Meeting. Conduct a coordination meeting prior to purchasing doors and door frames. Require attendance of the following: Contractor, County's Representative, hardware supplier, door supplier and frame supplier.

C. Coordination:
1. Examine the Contract Documents and furnish proper hardware for door openings. Examination includes, but is not limited to, the following:
a. If hardware Groups are missing smoke rated required devices, provide all devices to meet codes.
b. Where hardware Groups have different information from the Specifications, refer to the Specifications and Drawings for clarification. Provide hardware

represented by combining hardware information represented by Drawings and Specifications.

2. Coordinate work of this Section with other directly affected Sections involving manufacturer of any internal reinforcement for door hardware.
   a. In particular, coordinate door preparation in accordance with applicable regulatory and trade standards specified.
   b. Review details and conditions prior to ordering material. If door hand is changed during construction, coordinate and change hardware as necessary at no cost to the County.
   c. Coordinate Keying requirements as specified in this Section.
3. Submit templates and hardware schedule reviewed by County's Representative to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.
4. Send Installation Instructions to site with hardware.
5. To assure specified single source responsibility, coordinate with other Sections that have BHMA items to have the same models and devices throughout project.

1.3 ACTION SUBMITTALS

A. Hardware Schedule: List door numbers, locations, types of doors and frames, hardware group numbers, key symbols, and name of each item and its manufacturer, catalog number, material, and finish.
   1. Schedule shall be prepared under direct supervision of a member of the Door and Hardware Institute (DHI). Include verification of supervision on submittal.
   2. Submit in sufficient time for review by County's Representative and for supplier to place order with manufacturers in order to meet Project Schedule.
   3. Do not order hardware until Hardware Schedule has been reviewed and returned.
   4. Review of Hardware Schedule shall not be construed as certifying that the list is complete.

B. Wiring Diagrams: Provide complete and detailed system operation and elevation diagrams specially developed for each opening requiring electrified hardware, except openings where only magnetic hold-opens or door position switches are specified.
   1. Provide these diagrams with hardware schedule submittal for approval.
   2. Provide detailed wiring diagrams with hardware delivery to jobsite.

C. Product Data:
   1. Illustrations from manufacturer's catalogs and data in brochure form.
   2. Include labeling and listing information in accordance with the CBC and NFPA 80 for smoke-type doors.

D. Templates: Provide listing of manufacturer's template numbers for each item of hardware in hardware schedule.

E. Installation Instructions: Provide manufacturer's written installation and adjustment instructions for finish hardware.

F. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

G. Samples:
   1. Submit full-size operating hardware in specified finish when requested by the County's Representative.
   2. Affix labels to sample fully to identify manufacturer, class, type, and Project.
   3. After review, accepted samples may be obtained from County's Representative for installation on the Project. Pick up samples within 7 days of notification of acceptance or rejection.

1.4 INFORMATIONAL SUBMITTALS

A. Supplier qualifications as specified.

1.5 CLOSEOUT SUBMITTALS

A. Extended warranties.

1.6 QUALITY ASSURANCE

A. Finish hardware shall comply with applicable fire and building codes, including provisions for accessibility by the physically handicapped required by the California Building Code (CBC), California Code of Regulations (CCR), Title 24, Part 2.

B. Qualifications:
   1. Supplier: Firm specializing in the supply and servicing of institutional and commercial door hardware; accredited by manufacturers; and having a minimum of 3 years documented experience. Hardware supplier shall furnish a list of at least 10 completed projects. Include date competed, project location and references (past project contact information).
   2. Manufacturer: Manufacturer specializing in manufacturing institutional and commercial door hardware with a minimum 5 years' documented experience. Furnish list of at least 10 completed projects. Include date competed, project location, and project contact information to determine whether builders hardware is acceptable.

3. Installer: Trained in the trade of hanging commercial doors on commercial frames with commercial hardware.

C. Single Source Responsibility: Unless otherwise scheduled or specified, obtain each type of hardware from single manufacturer

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hardware to factory, shop, or mill of subcontractors and manufacturers requiring it or directly to the Project site as required.

B. Each article of hardware shall be individually packaged in manufacturer's original container, properly marked or labeled in conformity with the reviewed Hardware Schedule.

C. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 66 00 Delivery, Storage and Handling.

1.8 FIELD CONDITIONS

A. Templates: Furnish paper templates required by manufacturers of doors and frames to enable frame and door manufacturers to make proper provisions to receive hardware.

B. Where paper templates cannot be used effectively, furnish physical templates.

1.9 WARRANTY

A. Manufacturer: Unless otherwise specified below, furnish to County manufacturer’s written 2 year extended guarantee for automatic door operators against defects in materials and workmanship.

B. Contractor: Unless otherwise specified below, provide a written 2 year warranty agreeing to repair or replace hardware that fails in materials or workmanship or which does not perform as required.

PART 2 - PRODUCTS

2.1 MATERIALS - GENERAL

A. General Requirements:
1. The Specifications are intended to cover all doors in the Project and establish a type and standard of quality, but it is the responsibility of the Contractor to furnish proper hardware for all openings and for a complete installation, whether specified or not specified.
2. If there are omissions in Specifications and hardware groups required for a complete installation, it shall be called to the attention of County’s Representative when the Hardware Schedule is submitted.

3. No extra cost will be allowed because of changes or corrections necessary to facilitate the proper installation of any hardware.
4. Templates: All hardware applied to metal doors or jambs shall be made to template and secured by machine screws.

B. Hinges:
1. Type: Five-knuckle, McKinney Interior TA2714, Exterior TA2314, except as otherwise specified or required, or equal.
2. Exterior Out-Swinging: Stainless steel or solid bronze base material with nonremovable pins.
3. Unless otherwise noted or specified, the size of hinges will be determined by the following:
   a. Doors 1-3/4 Inches Thick and up to 41 Inches Wide: 4-1/2 inches.
   b. Doors 1-3/4 Inches Thick and 41 Inches to 48 Inches Wide: 4-1/2 inches, extra heavy.
   c. Provide widths sufficient to clear trim projection when door swings 180 degrees.
4. Furnish two hinges for doors up to 5 feet high and one additional hinge for each 2-1/2 feet of height or fraction thereof over 5 feet.
5. Provide ball-bearing hinges for doors with closers.

C. Locksets and Latchsets:
1. All locksets and latchsets shall be by the same manufacturer, unless otherwise specified.
2. Cylindrical: Schlage Series ND or equal, function as scheduled.
   a. Design: Schlage “Rhodes” or equal, unless otherwise scheduled.
   b. Backset: 2-3/4 inches, unless otherwise scheduled.
   c. Provide six-pin cylinders.
3. Mortise: Schlage Series L or equal, function as scheduled.
   a. Design: Schlage Lever No. 06 with “A” Standard Rose or equal, unless otherwise scheduled.
   b. Backset: 2-3/4 inches, unless otherwise scheduled.
4. Strikes:
   a. Furnish standard strikes with extended lips where required to protect trim from being marred by latch bolt.
   b. Verify whether standard or ANSI cutouts are provided in metal frames.
   c. Provide dust pocket to conceal interior of doorframe.
5. Dead bolts shall have a 1-inch projection.

D. Door Closers:
1. Overhead-door closers shall be Dorma 8900 Series or equal, unless otherwise scheduled. All closers shall be by the same manufacturer.
2. Do not install interior door closers on corridor side; except at doors corridor-to-corridor, mount on service side.
3. Door closers shall be sized according to manufacturer's recommended schedule of sizes as required for 5-year guaranty.

4. Pressure required to open doors shall not exceed the maximum pressure allowed by the CBC.
5. Supply drop plates at narrow top rail doors and parallel-arm closers at reverse-bevel doors and where doors swing full 180 degrees.
6. Provide closers at all toilet room doors.

E. Doorstops:
1. Install doorstops where required to prevent door or hardware from striking an adjacent wall or obstruction.
2. Wall-Type: Trimco 1270CXTB, or equal.
3. Floor-Type: Trimco 1211, or equal.
4. Overhead Type: Dorma #700S, or equal. Required where scheduled or where floor or wall stop cannot be used.
5. Other doorstops are specified in Hardware Schedule.
6. Provide carpet risers at carpeted areas.

F. Exit Devices: Comply with ANSI A156.3, function as scheduled. Exit devices shall be UL rated and shall meet requirements of state and local fire marshal and state building code.

G. Flush Bolts: Trimco or equal, 12 inches long, at top and bottom of inactive or designated door leaf, except at exit doors.
1. At exit doors, provide automatic flush bolts on inactive leaves.
2. At doors over 7 feet high, provide longer rods as required.

H. Kickplates: 0.050 inches thick, height as scheduled by 2-inches less than door width, screw-attached, countersunk holes, beveled 3 edges; Trimco as scheduled, Rockwood K1050, or equal.

I. Weatherstripping and Smoke Seals:
1. Jamb and Head: Pemko "Siliconseal" S88.
2. Door Bottom:
   a. Wood Doors: Pemko 434APKL.
   b. Steel Doors: Pemko 420AS.

J. Provide silencers for doors not scheduled to receive weatherstripping or seals; three silencers for single doors and two for pairs of doors.

K. Furnish metal thresholds as scheduled or as detailed.

L. Fastenings: Of suitable sizes, quantity, and material.
1. Fastenings shall match hardware material and finish.
2. Provide the following specific types:
   a. Machine screws and tamping shields for attaching hardware to concrete.
   b. Machine screws for attaching hardware to metal.
   c. Self-tapping screws for attaching kickplate to hollow metal doors.
   d. Full-thread-type screws for attaching butt hinges to wood doors.

3. Provide nonferrous or corrosion-resistant steel fasteners where exposed to weather.

M. Keys and Keying:
   1. Locks shall be keyed and registered at lock factory in accordance with County's key-control policy.
   2. Grandmasterkey, masterkey, key-alike, or key-different all locks in accordance with keying guidelines furnished by County. Include keying system with Hardware Schedule submitted County's Representative's review.
   3. Furnish six grandmasterkeys for each GMK set, six masterkeys each MK set, and three keys per lock for each keyed lock.
   4. Tag keys with location and deliver them to County upon completion of Work.
   5. Furnish construction keying with split-key system and twenty construction masterkeys. Upon completion of Work, remove construction key inserts from lock cylinders, and deliver construction keys and inserts to County.

N. Finishes:
   1. Exposed Items, Unless Otherwise Specified or Scheduled: Satin chrome 626 (US26D).
   2. Thresholds: Mill.
   3. Hinges: Satin chrome.
   4. Closers: Factory-painted finish to match adjacent hardware finish, unless specified or scheduled otherwise.

PART 3 - EXECUTION

3.1 INSTALLATION AND APPLICATION

A. Install hardware neatly and properly in accordance with manufacturer's instructions and reviewed submittals.

B. Provide hardware items not definitely specified but necessary for proper operation of a door assembly at no additional cost to County. Such items shall be of type and quality suitable for service required and comparable to adjacent hardware.

C. Modification to specified hardware, if required by construction characteristics, shall provide specified operational and functional features and shall be of specified quality and finish.
   1. Sizes shall be adequate for service to which hardware will be subjected in course of normal use.
   2. Modifications are subject to acceptance by County's Representative.
   3. Modifications shall not entail additional cost to County.

D. Protection:
   1. Projecting Items Such as Levers, Handles, and Pulls: Reinstall wrappings furnished by the manufacturer.

2. Flat Items Such as Kickplates: Retain manufacturer's protective covering, except to allow for installation.
3. Remove protection just prior to final acceptance of the building or as directed.

3.2 HARDWARE MOUNTING

A. Mounting Heights, Unless Otherwise Indicated on the Drawings:
   1. Hinges:
      a. Top: 5 inches from head to top of hinge leaf.
      b. Bottom: 10 inches from bottom of hinge to finished floor.
      c. Intermediate: Equal distance between top and bottom hinges, 3 feet 0 inches maximum.
      d. Two or More Intermediates: Equal distances between top and bottom hinges.
      e. Door supplier's standard locations for top and bottom hinges, if at variance from above, are acceptable.
   2. Levers (Locks or Latches): 38 inches from finish floor to center of lever.
   3. Deadlocks/Deadbolts: 44 inches from finished floor to center of cylinder.
   4. Pull/Push Plates: 43 inches from finish floor to top of plate.
   5. Push Bars: 38 inches from finish floor to center line.
   6. Door Pull: Same as push bar.
   7. Exit Device Crossbar: 38 inches from finished floor to center line of crossbar.

B. Floor stops shall be mounted maximum 4-inches from wall unless greater distance is required to prevent hardware from striking an adjacent wall or obstruction.

3.3 THRESHOLDS AND WEATHERSTRIPPING

A. Secure door bottom weatherstripping in accordance with manufacturer's instructions and as required to seal door to threshold or floor finish.

3.4 TESTING AND INSPECTION

A. Weatherstripping and seals shall not interfere with operation of doors and shall be adjusted for proper performance.

B. Door seals shall provide their intended sound, smoke, and weather functions.

C. Repair or replace installations which do not perform.

3.5 CLEANING

A. Just prior to final acceptance of building or as directed, remove protective paper coverings, and clean and polish hardware.

3.6 HARDWARE GROUPS

A. Manufacturer Abbreviations:

Manufacturer	Abbreviation
Dorma	DO
Blumcraft	BL
CR Laurence	CR
Hager	HA
McKinney	MC
Pemko Manufacturing Co.	PE
Schlage	SC
Trimco	TR
Jackson	JA

B. Hardware Columns - Example (Legend):

Qty	Device Description	Device # (include specification language)	Finish
1	- - - - - - - - - - - -	- - - - - - - - - - - -	- - - -

C. The following hardware Group/Sets are intended to establish type and standard of quality when used together with the other requirements of this Section.
   1. Examine Contract Documents and furnish proper hardware for door openings.
   2. Refer to Door Schedule on the Drawings for Hardware Group/Set assignments for each opening.
   3. The "Request-to-Exit" feature as described below is a security feature that announces/tells the security system if occupants is leaving the building interior area and similar to a motion-sensor the "Request-to-Exit" switch or device does not affect egress of the doors (unless noted, all doors in hardware sets are free egress at all times with no special knowledge to exit).
   4. Blank space below and after a Group/Set is intentional to avoid, if possible, splitting a Hardware Group/Set onto two pages.

Exterior Hardware Sets (Typically Two-Digit Set Numbers)

Hardware Group/Set #01

In addition to the devices specified in hardware group/set below, also coordinate devices in specification Section 08 7113 "Automatic Door Operators" (furnish & install doors, frames and related scope per complete Contract Documents):					
2	Ea.	Pivot Sets	OP440 3/4"Offset x Top Pivot x two Intermediate Pivots at each leaf	626	DO
2	Ea.	L-Shaped, Top Latching Exit/Panic Device	PA-100 x "F" Exterior Full Height Pull, exterior keyed x interior dogging feature		CR
1	Ea.	Electrified Strike (fail secure)	ESK series (per application: pair doors provide ESK2 and single doors provide ESK1)	630	CR
1	Ea.	Electrified Strike Power Supply	By security (coordinate with divisions 25-28 and applicable drawings)		
2	Ea.	I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device)	626	SC
2	Ea.	Permanent Core	As required for locking devices. Before final lever style and/or permanent keying is submitted or ordered verify in field Client current keying system	626	SC
1	Ea.	Closer at RHR Door	Top Jamb 4040XP	689	LC
1	Ea.	Low Energy Operator System (includes push-plate devices)	#4000LE - By Section 08 7113 - 4-1/2" wide x 6" tall, offset center hung, single acting) - Provide low energy operator only at the left hand reverse door (LHR)	689	HO
2	Ea.	Floor Stop	#7281	630	TR
2	Ea.	Seals, Concealed Door Bottom Sweeps, Threshold and Overhead Rain Drip	Meet "no water penetration warranties", verify flashing, drip caps, seals and thresholds before submittals: - Seals are to be furnished by aluminum door manufacturer to meet no water penetration warranties (including head, jambs, door bottom and above door flashing). - Threshold: Replace in-kind, but utilize the following for pricing and coordination: Pemko device #2549A (width to suit jamb thickness) x Type 13 or 11 or as required for final pivot template x FHSL25 fasteners by Pemko or approved manufacturer.		
2	Ea.	Door Position Switches (also known as Alarm	If DPS devices are required by security or electrical, coordinate door & frame preparation/templates as		

		Contacts, Door Contacts or DPS devices)	required per Contract Documents (see Divisions 25-28 and applicable drawings).
1	Ea.	Request to Exit Device (see free egress note in above specifications)	By security (coordinate with divisions 25-28 and applicable drawings)
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required per Contract Documents: - The electrified hardware specified above can be utilized for #1) non-card reader, remote access control applications (unlocked / locked remotely for open during business hours / locked after-hours) and #2) local card readers at openings as directed by architectural drawings, security or electrical. - Coordinate with security or electrical Divisions 25-28 and applicable drawings as hardware does not include card reader locations.
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).			

Hardware Group/Set #02

2	Ea.	Center Pivot Sets	Replace in-kind, but utilize the following for pricing and coordination: Dorma device #CPA440 x #HD8062 top pivot (or equal heavy duty / extended spindle device).	626	DO
2	Ea.	Applied Frame Stops	#AS895 at header to stop door from swinging on to roof deck.	626	IV
2	Ea.	Electrified Power Transfer Devices	At each leaf, verify in field if power transfer devices to run wires from frame to door already exists. Submit one of the following: - #1) Written documentation that existing wire runs / connectivity exists - #2) Written documentation to provide new connectivity and the design team, preferred concealed wire transfer device #4612-2 x Adams Rite manufacturing. - #3) If concealed device #4612-2 cannot be cut / templated into frame and door, submit surface mounted wire loop device #TSB-C x Securitron manufacturing.		
1	Ea.	Concealed Vertical-Type Exit/Panic Device Electrified Trim	RX 9947NL-F x E996NL x LBR (less bottom rod)	626	VO
1	Ea.	Concealed Vertical-Type Exit/Panic Device	RX 9947EO x LBR (less bottom rod)	626	VO
1	Ea.	E996 Power Supply	PS902-4R (coordinate with divisions 25-28 and applicable drawings)		VO
2	Ea.	I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device)	626	SC
2	Ea.	Permanent Core	As required for locking devices. Before final lever style and/or permanent keying is submitted or ordered verify in field Client current keying system	626	SC
2	Ea.	Surface Closer	4040XP x EDA	689	LC
2	Ea.	Floor Stop	#7281	630	TR
1	Set	Seals, Concealed Door Bottom Sweeps, Threshold and Overhead Rain Drip	Meet “no water penetration warranties”, verify flashing, drip caps, seals and thresholds before submittals: - Seals are to be furnished by aluminum door manufacturer to meet no water penetration (including head, jambs, door bottom and above door flashing). - Threshold: Replace in-kind, but utilize the following for pricing and coordination: Pemko device #2549A (width to suit jamb thickness) x Type 13 or 11 or as required		

			for final pivot template x FHSL25 fasteners by Pemko or approved manufacturer.
2	Ea.	Door Position Switches (also known as Alarm Contacts, Door Contacts or DPS devices)	If DPS devices are required by security or electrical, coordinate door & frame preparation/templates as required per Contract Documents (see Divisions 25-28 and applicable drawings).
2	Ea.	Request to Exit Device (see free egress note in above specifications)	By security (coordinate with divisions 25-28 and applicable drawings)
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required per Contract Documents: - The electrified hardware specified above can be utilized for #1) non-card reader, remote access control applications (unlocked / locked remotely for open during business hours / locked after-hours) and #2) local card readers at openings as directed by architectural drawings, security or electrical. - Coordinate with security or electrical Divisions 25-28 and applicable drawings as hardware does not include card reader locations.
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).			

Hardware Group/Set #03

_	Ea.	Hinges (existing frame conditions)	T4A3386 heavy duty hinges or TA2314 medium duty hinges x 652 finish by McKinney manufacturing: - Verify in field existing frame preparation/templates and submit, furnish & install sized hinges to match existing frame. - Provide hinge width to enable door to open 175 degrees to hit stop. - Gap between doors, as well as between frame & doors at the head & jambs, to be no greater than 1/8".	630	MC
1	Ea.	Electrified Hinge	T4A3386 x QC6 (size to match top and bottom hinges per above)	630	MC
1	Ea.	Auto Flush Bolt (top latch only where possible)	At non-rated 20 minute rated wood doors or at all hollow metal doors provide either #3810 (metal doors) or #3815L (wood doors) as required per door material. - For wood doors over 20 minutes in rating, provide top & bottom Flushbolts #3815L x #3815L and dust proof strike device #3911 - For metal doors over 20 minutes in rating, provide fire bolt #3850 (no bottom bolt or dust proof strike).	626/630	TR
1	Ea.	Dust Proof Strike	#3911	626	TR
1	Ea.	Rated, Concealed Vertical-Type Exit/Panic Device Electrified Trim	RX 9947NL-F x E996NL	626	VO
1	Ea.	E996 Power Supply	PS902-4R (coordinate with divisions 25-28 and applicable drawings)		VO
1	Ea.	I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	As required for locking devices. Before final lever style and/or permanent keying is submitted or ordered verify in field Client current keying system	626	SC
1	Ea.	Coordinator	#3094 series x filler plates x mounting brackets as required for coordinated hardware x painted to match frame		TR
2	Ea.	Surface Closer	4040XP x CUSH	689	LC

2	Ea.	Kick Plate	KO050 10" tall x 1" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Seals	Provide seals at head & jambs: - If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer. - If frame is aluminum, then seals are to be furnished by aluminum frame manufacturer (for sound dampening if non-rated opening, smoke or fire seals if rated conditions)		
2	Ea.	Door Bottom Sweep	315CN by Pemko or approved manufacturer.		
1	Ea.	Threshold	2727A or 176A or per detail (sized to fit the condition) x FSL25 by Pemko or approved manufacturer.		
2	Ea.	Door Position Switches (also known as Alarm Contacts, Door Contacts or DPS devices)	If DPS devices are required by security or electrical, coordinate door & frame preparation/templates as required per Contract Documents (see Divisions 25-28 and applicable drawings).		
1	Ea.	Request to Exit Device (see free egress note in above specifications)	By security (coordinate with divisions 25-28 and applicable drawings)		
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required per Contract Documents: - The electrified hardware specified above can be utilized for #1) non-card reader, remote access control applications (unlocked / locked remotely for open during business hours / locked after-hours) and #2) local card readers at openings as directed by architectural drawings, security or electrical. - Coordinate with security or electrical Divisions 25-28 and applicable drawings as hardware does not include card reader locations.		
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					

Hardware Group/Set #04

_	Ea.	Hinge	T4A3386 x NRP (size & quantity per 08 7100)	630	MC
1	Ea.	Rim Panic Hardware No Exterior Trim	99EO	626	VO
1	Ea.	Surface Closer	4040XP x EDA	689	LC
1	Ea.	Door Stop	7281	630	TR
1	Set	Seals, Concealed Door Bottom Sweeps, Threshold and Overhead Rain Drip	Meet "no water penetration warranties", verify flashing, drip caps, seals and thresholds before submittals: - Seals are to be furnished by aluminum door/frame manufacturer to meet no water penetration (including head, jambs, door bottom and above door flashing). - Threshold: Pemko device #2549A (width to suit jamb thickness) x Type 13 or 11 or as required for final pivot template x FHSL25 fasteners by Pemko or approved manufacturer.		
1	Ea.	Door Position Switches (also known as Alarm Contacts, Door Contacts or DPS devices)	If DPS devices are required by security or electrical, coordinate door & frame preparation/templates as required per Contract Documents (see Divisions 25-28 and applicable drawings).		
2	Ea.	Request to Exit Device (see free egress note in above specifications)	By security (coordinate with divisions 25-28 and applicable drawings)		
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required per Contract Documents: - Annunciated Alarm when door opened - Coordinate with security or electrical Divisions 25-28 and applicable drawings as hardware does not include card reader locations.		
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					

Hardware Group/Set #05

1	Ea.	Center Pivot Sets	Replace in-kind, but utilize the following for pricing and coordination: Dorma device #CPA440 x #HD8062 top pivot (or equal heavy duty / extended spindle device).	626	DO
1	Ea.	Applied Frame Stops	#AS895 at header to stop door from swinging on to roof deck.	626	IV
1	Ea.	Electrified Power Transfer Devices	At each leaf, verify in field if power transfer devices to run wires from frame to door already exists. Submit one of the following: - #1) Written documentation that existing wire runs / connectivity exists - #2) Written documentation to provide new connectivity and the design team, preferred concealed wire transfer device #4612-2 x Adams Rite manufacturing. - #3) If concealed device #4612-2 cannot be cut / templated into frame and door, submit surface mounted wire loop device #TSB-C x Securitron manufacturing.		
1	Ea.	Rim-Type Exit/Panic Device Electrified Trim	RX 99NL-F x E996NL	626	VO
1	Ea.	E996 Power Supply	PS902-4R		VO
1	Ea.	I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	As required for locking devices. Before final lever style and/or permanent keying is submitted or ordered verify in field Client current keying system	626	SC
1	Ea.	Surface Closer	4040XP x EDA	689	LC
1	Ea.	Floor Stop	#7281	630	TR
1	Set	Seals, Concealed Door Bottom Sweeps, Threshold and Overhead Rain Drip	Meet “no water penetration warranties”, verify flashing, drip caps, seals and thresholds before submittals: - Seals are to be furnished by aluminum door manufacturer to meet no water penetration (including head, jambs, door bottom and above door flashing). - Threshold: Replace in-kind, but utilize the following for pricing and coordination: Pemko device #2549A (width to suit jamb thickness) x Type 13 or 11 or as required for final pivot template x FHSL25 fasteners by Pemko or approved manufacturer.		
1	Ea.	Door Position Switches (also known as Alarm	If DPS devices are required by security or electrical, coordinate door & frame preparation/templates as		

		Contacts, Door Contacts or DPS devices)	required per Contract Documents (see Divisions 25-28 and applicable drawings).
1	Ea.	Request to Exit Device (see free egress note in above specifications)	By security (coordinate with divisions 25-28 and applicable drawings)
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required per Contract Documents: - The electrified hardware specified above can be utilized for #1) non-card reader, remote access control applications (unlocked / locked remotely for open during business hours / locked after-hours) and #2) local card readers at openings as directed by architectural drawings, security or electrical. - Coordinate with security or electrical Divisions 25-28 and applicable drawings as hardware does not include card reader locations.
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).			

Interior Hardware Sets (Typically Three-Digit Set Numbers)

Hardware Group/Set #101

NOTE 1: Refer to door schedule and plan page notes for additional hardware requirements.

NOTE 2: All hardware supplied by door or opening manufacturers (non-section 08 71 00 door hardware required).

NOTE 3: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

Hardware Group/Set #102

NOTE 1: Refer to door schedule and plan page notes for additional hardware requirements.

NOTE 2: Re-adjust or adjust closers to meet ADA opening force requirements per manufacturer's original warranties and recommendations.

NOTE 3 - Remainder of work: Non-Section 08 7100 tasks including, but not limited to Division 09 prime/paint. Furnish scope in accordance with Contract Documents. Tasks/scope for painting when Section 08 71 00 hardware s adjacent to painted areas, doors or frames includes uninstalling hardware, painting/finish as required by other scope, then reinstall hardware according to manufacturer's original warranties and recommendations.

Hardware Group/Set #103

2	Ea.	Floor Closer	Jackson J995BCD x 3/4" offset hung, single acting with backcheck. Provide complete package to meet warranty for door size and weight. System includes, but is not limited to cement case, floor closer, top pivot set, intermediate pivots (quantity per specifications) & installation tools.	626	JA
2	Ea.	L-Shaped, Top Latching Exit/Panic Device	PA-100 x "F" Exterior Full Height Pull, exterior keyed x interior dogging feature		CR
1	Ea.	Electrified Strike (fail secure)	ESK series (per application: pair doors provide ESK2 and single doors provide ESK1)	630	CR
1	Ea.	Electrified Strike Power Supply	BPS-24-2 (coordinate with Divisions 25-28 and applicable drawings)		SN
2	Ea.	I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device)	626	SC
2	Ea.	Permanent Core	As required for locking devices. Before final lever style and/or permanent keying is submitted or ordered verify in field Client current keying system	626	SC
2	Ea.	Floor Stop	#7281	630	TR
2	Ea.	Door Position Switches (also known as Alarm Contacts, Door Contacts or DPS devices)	If DPS devices are required by security or electrical, coordinate door & frame preparation/templates as required per Contract Documents (see Divisions 25-28 and applicable drawings).		
_	Ea.	Request to Exit Device (see free egress note in above specifications)	By security (coordinate with divisions 25-28 and applicable drawings)		
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required per Contract Documents: - The electrified hardware specified above can be utilized for #1) non-card reader, remote access control applications (unlocked / locked remotely for open during business hours / locked after-hours) and #2) local card readers at openings as directed by architectural drawings, security or electrical. - Coordinate with security or electrical Divisions 25-28 and applicable drawings as hardware does not include card reader locations.		
Note 1: Balance of perimeter seals and meeting stiles by door manufacturer.					

Note 2: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

Hardware Group/Set #104

_	Ea.	Hinge	T4A3786 (size & quantity per 08 7100)	652	MC
1	Ea.	Electrified Hinge	T4A3786 x QC6 (size per 08 7100)	652	MC
1	Ea.	Electrified Lockset	ND92T EU x RHO RX x 10-025	626	SC
1	Ea.	Permanent Core	As required for locking devices. Before final lever style and/or permanent keying is submitted or ordered verify in field Client current keying system	626	SC
1	Ea.	Surface Closer	4040XP EDA (installed push-side of door if door swings out) or 4040XP x REG (installed pull-side of door if door swings in) per specifications	689	LC
1	Ea.	Door Stop	1270CX (wall stops where possible, but provide #1211 if wall stop cannot be utilized at lever side of door. Also provide risers as required per undercut condition)	626	TR
1	Ea.	Seals	Provide seals at head & jambs: - If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer. - If frame is aluminum, then seals are to be furnished by aluminum frame manufacturer (for sound dampening if non-rated opening, smoke or fire seals if rated conditions)		
1	Ea.	Threshold	Per detail		
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required per Contract Documents: - The electrified hardware specified above can be utilized for #1) non-card reader, remote access control applications (unlocked / locked remotely for open during business hours / locked after-hours) and #2) local card readers at openings as directed by architectural drawings, security or electrical. - Coordinate with security or electrical Divisions 25-28 and applicable drawings as hardware does not include card reader locations.		
1	Ea.	Request-to-Exit Sensor (see free egress note in above specifications)	Parts/devices specified in above locking hardware (coordinate with divisions 25-28 and applicable drawings).		
1	Ea.	Door Position Switches	If DPS devices are required by security or electrical,		

		(also known as Alarm Contacts, Door Contacts or DPS devices)	coordinate door & frame preparation/templates as required per Contract Documents (see Divisions 25-28 and applicable drawings). For pair doors template for two devices, single template for one device.
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).			

Hardware Group/Set #105

_	Ea.	Hinge	T4A3786 (size & quantity per 08 7100)	652	MC
1	Ea.	Storeroom-Type Lock	ND80TD x RHO x 10-025	626	SC
1	Ea.	Permanent Core	As required for locking devices. Before final lever style and/or permanent keying is submitted or ordered verify in field Client current keying system	626	SC
1	Ea.	Surface Closer	4040XP EDA (installed push-side of door if door swings out) or 4040XP x REG (installed pull-side of door if door swings in) per specifications	689	LC
1	Ea.	Kick Plate	KO050 10" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	1270CX (wall stops where possible, but provide #1211 if wall stop cannot be utilized at lever side of door. Also provide risers as required per undercut condition)	626	TR
1	Ea.	Seals	Provide seals at head & jambs: - If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer. - If frame is aluminum, then seals are to be furnished by aluminum frame manufacturer (for sound dampening if non-rated opening, smoke or fire seals if rated conditions)		
1	Ea.	Threshold	Per detail		
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					

Hardware Group/Set #106

_	Ea.	Hinge	T4A3786 (size & quantity per 08 7100)	652	MC
1	Ea.	Passage Latchset	ND10S x RHO x 10-025	626	SC
1	Ea.	Door Stop	1270CX (wall stops where possible, but provide #1211 if wall stop cannot be utilized at lever side of door. Also provide risers as required per undercut condition)	626	TR
1	Ea.	Auto Door Bottom	411APKL or 420APKL (as required per door material or wood or hollow metal)		PE
1	Ea.	Threshold	276A or per detail (sized to fit the condition) x FSL25		PE
1	Ea.	Sound Seals	Provide seals at head & jambs: - If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer. - If frame is aluminum, then seals are to be furnished by aluminum frame manufacturer (for sound dampening if non-rated opening, smoke or fire seals if rated conditions)		
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					

Hardware Group/Set #107

_	Ea.	Hinge	T4A3786 (size & quantity per 08 7100)	652	MC
2	Ea.	Back to Back Pulls	1185 SS x 96" length (installed 10” AFF to meet ADA 10” of clear unobstructed surface at bottom of door) x E x 1 (0.5” 630 no insert) x 630.	630	TR
1	Ea.	Surface Closer	4040XP EDA (installed push-side of door if door swings out) or 4040XP x REG (installed pull-side of door if door swings in) per specifications	689	LC
1	Ea.	Kick Plate	KO050 10" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Mop Plate at inswinging doors	KM050 6" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	1270CX (wall stops where possible, but provide #1211 if wall stop cannot be utilized at lever side of door. Also provide risers as required per undercut condition)	626	TR
1	Ea.	Seals	Provide seals at head & jambs: - If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer. - If frame is aluminum, then seals are to be furnished by aluminum frame manufacturer (for sound dampening if non-rated opening, smoke or fire seals if rated conditions)		
1	Ea.	Auto Door Bottom	411APKL or 420APKL (as required per door material or wood or hollow metal)		PE
1	Ea.	Threshold	Per detail (1/4” High AFF)		
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					

Hardware Group/Set #108

_	Ea.	Hinge	T4A3786 (size & quantity per 08 7100)	652	MC
1	Ea.	Privacy x Occupancy Indicator (exterior side lever can be left unlocked. Emergency cylinder/key override):	L9456T x 06A x #L283-722 (interior ADA thumbturn and exterior side emergency cylinder/key override)	630	SC
1	Ea.	Permanent Core	As required for locking devices. Before final permanent keying is submitted or ordered verify in field Client current keying system	626	SC
1	Ea.	Surface Closer	4040XP EDA (installed push-side of door if door swings out) or 4040XP x REG (installed pull-side of door if door swings in) per specifications	689	LC
1	Ea.	Kick Plate	KO050 10" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Mop Plate (at in-swinging doors only)	KM050 6" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	1270CX (wall stops where possible, but provide #1211 if wall stop cannot be utilized at lever side of door. Also provide risers as required per undercut condition)	626	TR
1	Ea.	Seals (sound dampening)	Provide seals at head & jambs: - If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer. - If frame is aluminum, then seals are to be furnished by aluminum frame manufacturer (for sound dampening if non-rated opening, smoke or fire seals if rated conditions)		
1	Ea.	Auto Door Bottom	411APKL or 420APKL (as required per door material or wood or hollow metal)		PE
1	Ea.	Threshold	Per detail (1/4” High AFF)		
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					

Hardware Group/Set #109

_	Ea.	Hinge	T4A3786 (size & quantity per 08 7100)	652	MC
1	Ea.	Auto Flush Bolt (top latch only where possible)	At non-rated 20 minute rated wood doors or at all hollow metal doors provide either #3810 (metal doors) or #3815L (wood doors) as required per door material. - For wood doors over 20 minutes in rating, provide top & bottom Flushbolts #3815L x #3815L and dust proof strike device #3911 - For metal doors over 20 minutes in rating, provide fire bolt #3850 (no bottom bolt or dust proof strike).	626/ 630	TR
1	Ea.	Storeroom-Type Lock	ND80TD x RHO x 10-025 (at rated pairs provide 3/4" latch throw)	626	SC
1	Ea.	Permanent Core	As required for locking devices. Before final lever style and/or permanent keying is submitted or ordered verify in field Client current keying system	626	SC
2	Ea.	Floor Stop	1214	626	TR
2	Ea.	Kick Plate	KO050 10" tall x 1" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
2	Ea.	Door Silencers	SR64 or SR65 (as required)	GR	IV
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents). At rated openings, provide 4031 x CUSG arm closers, S88 Seals and coordinator #3094 series x filler plates x mounting brackets as required.					

Hardware Group/Set #110

_	Ea.	Gate Hinge/Hanging Devices	Hanging device hardware by chain-link gate manufacturer		
1	Ea.	Storage Room Lock	ND80TD x RHO x 10-025	626	SC
1	Ea.	Permanent Large Format Interchangeable Core	As required for locking devices. Before final permanent keying is submitted or ordered verify in field Client current keying system	626	SC
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices required in 08 71 00 language above, architectural plans & full specification documents).					

Hardware Group/Set #111

_	Ea.	Hinge	T4A3386 (size & quantity per 08 7100)	630	MC
1	Ea.	Privacy x Occupancy Indicator (exterior side lever can be left unlocked. Emergency cylinder/key override):	L9456T x 06A x #L283-722 (interior ADA thumbturn and exterior side emergency cylinder/key override)	630	SC
1	Ea.	Permanent Core	As required for locking devices. Before final permanent keying is submitted or ordered verify in field Client current keying system	626	SC
1	Ea.	Kick Plate	KO050 10" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Mop Plate	KM050 6" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	1270CX	626	TR
1	Ea.	Seals	Provide seals at head & jambs: - If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer. - If frame is aluminum, then seals are to be furnished by aluminum frame manufacturer (for sound dampening if non-rated opening, smoke or fire seals if rated conditions)		
1	Ea.	Threshold	Per detail		
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					

Hardware Group/Set #112

_	Ea.	Hinges (existing frame conditions)	T4A3786 heavy duty hinges or TA2714 medium duty hinges x 652 finish by McKinney manufacturing: - Verify in field existing frame preparation/templates and submit, furnish & install sized hinges to match existing frame. - Provide hinge width to enable door to open 175 degrees to hit stop. - Gap between doors, as well as between frame & doors at the head & jambs, to be no greater than 1/8".	652	MC
1	Ea.	Electrified Hinge	T4A3786 x QC6 (size to match top and bottom hinges per above)	652	MC
1	Ea.	Rated, Rim-Type Exit/Panic Device Electrified Trim	RX 99NL-F x E996NL	630	VO
1	Ea.	E996 Power Supply	PS902-4R		VO
1	Ea.	I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	As required for locking devices. Before final lever style and/or permanent keying is submitted or ordered verify in field Client current keying system	626	SC
1	Ea.	Surface Closer x Stop Arm	4040XP x CUSH (at 90 degrees)	689	LC
1	Ea.	Seals	Provide S88D seals (head & jambs) by Pemko or approved seal manufacturer.		
1	Ea.	Threshold	Per detail		PE
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required per Contract Documents: - The electrified hardware specified above can be utilized for #1) non-card reader, remote access control applications (unlocked / locked remotely for open during business hours / locked after-hours) and #2) local card readers at openings as directed by architectural drawings, security or electrical. - Coordinate with security or electrical Divisions 25-28 and applicable drawings as hardware does not include card reader locations.		

1	Ea.	Request-to-Exit Sensor (see free egress note in above specifications)	Parts/devices specified in above locking hardware (coordinate with divisions 25-28 and applicable drawings).
1	Ea.	Door Position Switches (also known as Alarm Contacts, Door Contacts or DPS devices)	If DPS devices are required by security or electrical, coordinate door & frame preparation/templates as required per Contract Documents (see Divisions 25-28 and applicable drawings).
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).			

Hardware Group/Set #113

_	Ea.	Hinges (existing frame conditions)	T4A3786 heavy duty hinges or TA2714 medium duty hinges x 652 finish by McKinney manufacturing: - Verify in field existing frame preparation/templates and submit, furnish & install sized hinges to match existing frame. - Provide hinge width to enable door to open 175 degrees to hit stop. - Gap between doors, as well as between frame & doors at the head & jambs, to be no greater than 1/8”.	652	MC
1	Ea.	Passage Latchset	ND10S x RHO x 10-025	626	SC
1	Ea.	Surface Closer	Re-use existing closer	689	LC
1	Ea.	Kick Plate	KO050 10" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	1214	626	TR
1	Ea.	Seals	Provide S88D seals (head & jambs) by Pemko or approved seal manufacturer.		
1	Ea.	Auto Door Bottom	411APKL or 420APKL (as required per door material or wood or hollow metal) by Pemko or approved seal manufacturer.		
1	Ea.	Threshold	276A or per detail (sized to fit the condition) x FSL25 by Pemko or approved seal manufacturer.		
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					

Hardware Group/Set #114

_	Ea.	Hinges (existing frame conditions)	T4A3786 heavy duty hinges or TA2714 medium duty hinges x 652 finish by McKinney manufacturing: - Verify in field existing frame preparation/templates and submit, furnish & install sized hinges to match existing frame. - Provide hinge width to enable door to open 175 degrees to hit stop. - Gap between doors, as well as between frame & doors at the head & jambs, to be no greater than 1/8".	652	MC
1	Ea.	Electrified Hinge	T4A3786 x QC6 (size to match top and bottom hinges per above)	652	MC
1	Ea.	Electrified Lockset	ND92T EU x RHO RX x 10-025	626	SC
1	Ea.	Permanent Core	As required for locking devices. Before final lever style and/or permanent keying is submitted or ordered verify in field Client current keying system	626	SC
1	Ea.	Surface Closer	4040XP EDA	689	LC
1	Ea.	Door Stop	1214	626	TR
1	Ea.	Seals	Provide seals at head & jambs: - If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer. - If frame is aluminum, then seals are to be furnished by aluminum frame manufacturer (for sound dampening if non-rated opening, smoke or fire seals if rated conditions)		
1	Ea.	Auto Door Bottom	411APKL or 420APKL (as required per door material or wood or hollow metal) by Pemko or approved seal manufacturer.		
1	Ea.	Threshold	276A or per detail (sized to fit the condition) x FSL25 by Pemko or approved seal manufacturer.		
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required per Contract Documents: - The electrified hardware specified above can be utilized for #1) non-card reader, remote access control applications (unlocked / locked remotely for open during business hours / locked after-hours) and #2) local card readers at openings as directed by architectural drawings, security or electrical. - Coordinate with security or electrical Divisions 25-28		

			and applicable drawings as hardware does not include card reader locations.
1	Ea.	Request-to-Exit Sensor (see free egress note in above specifications)	Parts/devices specified in above locking hardware (coordinate with divisions 25-28 and applicable drawings).
1	Ea.	Door Position Switches (also known as Alarm Contacts, Door Contacts or DPS devices)	If DPS devices are required by security or electrical, coordinate door & frame preparation/templates as required per Contract Documents (see Divisions 25-28 and applicable drawings). For pair doors template for two devices, single template for one device.
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).			

Hardware Group/Set #115

_	Ea.	Hinges (existing frame conditions)	T4A3786 heavy duty hinges or TA2714 medium duty hinges x 652 finish by McKinney manufacturing: - Verify in field existing frame preparation/templates and submit, furnish & install sized hinges to match existing frame. - Provide hinge width to enable door to open 175 degrees to hit stop. - Gap between doors, as well as between frame & doors at the head & jambs, to be no greater than 1/8”.	652	MC
1	Ea.	Rim-Type Exit/Panic Device x Keyed Lever Trim	99L x 996L-R/V (at rated doors, provide additional –F nomenclature)	630	VO
1	Ea.	I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	As required for locking devices. Before final lever style and/or permanent keying is submitted or ordered verify in field Client current keying system	626	SC
1	Ea.	Surface Closer	Re-use existing closer	689	LC
1	Ea.	Kick Plate	KO050 10" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
1	Ea.	Door Stop	1214	626	TR
1	Ea.	Seals	Provide S88D seals (head & jambs) by Pemko or approved seal manufacturer.		
1	Ea.	Auto Door Bottom	411APKL or 420APKL (as required per door material or wood or hollow metal) by Pemko or approved seal manufacturer.		
1	Ea.	Threshold	276A or per detail (sized to fit the condition) x FSL25 by Pemko or approved seal manufacturer.		
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					

Hardware Group/Set #116

_	Ea.	Hinge/Lock	Re-use existing lock and hinges		
1	Ea.	Electrified Strike	1006 series x 2005 SMART PAC III (as required by lock latch, verify in field before submittals).	626	SC
1	Ea.	Re-Key Permanent Core	As required for locking devices. Before final lever style and/or permanent keying is submitted or ordered verify in field Client current keying system	626	SC
1	Ea.	Surface Closer	4040XP x REG	689	LC
1	Ea.	Seals	Provide S88D seals (head & jambs) by Pemko or approved seal manufacturer.		
1	Ea.	Threshold	276A or per detail (sized to fit the condition) x FSL25		PE
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required per Contract Documents: - The electrified hardware specified above can be utilized for #1) non-card reader, remote access control applications (unlocked / locked remotely for open during business hours / locked after-hours) and #2) local card readers at openings as directed by architectural drawings, security or electrical. - Coordinate with security or electrical Divisions 25-28 and applicable drawings as hardware does not include card reader locations.		
1	Ea.	Request-to-Exit Sensor (see free egress note in above specifications)	Parts/devices specified in above locking hardware (coordinate with divisions 25-28 and applicable drawings).		
1	Ea.	Door Position Switches (also known as Alarm Contacts, Door Contacts or DPS devices)	If DPS devices are required by security or electrical, coordinate door & frame preparation/templates as required per Contract Documents (see Divisions 25-28 and applicable drawings).		
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					

Hardware Group/Set #117

1	Ea.	Re-Key Permanent Core	As required for locking devices. Before final lever style and/or permanent keying is submitted or ordered verify in field Client current keying system	626	SC
1	Ea.	Seals	Provide S773D seals (head & jambs) by Pemko or approved seal manufacturer.		
1	Ea.	Astragal	357 x S77 seal by Pemko or approved seal manufacturer.		
2	Ea.	Auto Door Bottoms	412CRL by Pemko or approved seal manufacturer.		
1	Ea.	Threshold	173A or per detail (sized to fit the condition) by Pemko or approved seal manufacturer.		

NOTE 1: Re-adjust or adjust existing hardware per manufacturer's original warranties and recommendations.

NOTE 3 - Remainder of work: Non-Section 08 7100 tasks including, but not limited to Division 09 prime/paint. Furnish scope in accordance with Contract Documents. Tasks/scope for painting when Section 08 71 00 hardware s adjacent to painted areas, doors or frames includes uninstalling hardware, painting/finish as required by other scope, then reinstall hardware according to manufacturer's original warranties and recommendations.

Hardware Group/Set #118

_	Ea.	Hinge/Lock	Re-use existing lock and hinges		
1	Ea.	Electrified Strike	1006 series x 2005 SMART PAC III (as required by lock latch, verify in field before submittals).	626	SC
1	Ea.	Re-Key Permanent Core	As required for locking devices. Before final lever style and/or permanent keying is submitted or ordered verify in field Client current keying system	626	SC
1	Ea.	Surface Closer	4040XP x REG	689	LC
1	Ea.	Seals	Provide S773D seals (head & jambs) by Pemko or approved seal manufacturer.		
1	Ea.	Auto Door Bottom	411APKL or 420APKL (as required per door material or wood or hollow metal)		PE
1	Ea.	Threshold	270A or per detail (sized to fit the condition) x FSL25		PE
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required per Contract Documents: - The electrified hardware specified above can be utilized for #1) non-card reader, remote access control applications (unlocked / locked remotely for open during business hours / locked after-hours) and #2) local card readers at openings as directed by architectural drawings, security or electrical. - Coordinate with security or electrical Divisions 25-28 and applicable drawings as hardware does not include card reader locations.		
1	Ea.	Request-to-Exit Sensor (see free egress note in above specifications)	Parts/devices specified in above locking hardware (coordinate with divisions 25-28 and applicable drawings).		
1	Ea.	Door Position Switches (also known as Alarm Contacts, Door Contacts or DPS devices)	If DPS devices are required by security or electrical, coordinate door & frame preparation/templates as required per Contract Documents (see Divisions 25-28 and applicable drawings).		
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					

Hardware Group/Set #119

_	Ea.	Hinge	Re-use existing		
1	Ea.	Office-Type Lock	ND53TD x RHO x 10-025	626	SC
1	Ea.	Permanent Core	As required for locking devices. Before final lever style and/or permanent keying is submitted or ordered verify in field Client current keying system	626	SC
1	Ea.	Seals	Provide S773D seals (head & jambs) by Pemko or approved seal manufacturer.		
1	Ea.	Auto Door Bottom	411APKL or 420APKL (as required per door material or wood or hollow metal)		PE
1	Ea.	Threshold	270A or per detail (sized to fit the condition) x FSL25		PE

NOTE 1: Re-adjust or adjust existing hardware per manufacturer's original warranties and recommendations.

NOTE 3 - Remainder of work: Non-Section 08 7100 tasks including, but not limited to Division 09 prime/paint. Furnish scope in accordance with Contract Documents. Tasks/scope for painting when Section 08 71 00 hardware s adjacent to painted areas, doors or frames includes uninstalling hardware, painting/finish as required by other scope, then reinstall hardware according to manufacturer's original warranties and recommendations.

Hardware Group/Set #120

_	Ea.	Hinge	TA2714 (size & quantity per 08 7100)	652	MC
1	Ea.	Storage Room Lock	ND80TD x RHO x 10-025	626	SC
1	Ea.	Permanent Core	As required for locking devices. Before final lever style and/or permanent keying is submitted or ordered verify in field Client current keying system	626	SC
1	Ea.	Overhead Stop	10 series (size -336 or as required by door width)	689	RX
1	Ea.	Kick Plate	KO050 10" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows	630	TR
3	Ea.	Door Silencers	SR64 or SR65 (as required)	GR	IV

NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

Hardware Group/Set #121

_	Ea.	Hinge	TA2714 (size & quantity per 08 7100)	652	MC
1	Ea.	Auto Flush Bolt (top latch only where possible)	At non-rated 20 minute rated wood doors or at all hollow metal doors provide either #3810 (metal doors) or #3815L (wood doors) as required per door material. - For wood doors over 20 minutes in rating, provide top & bottom Flushbolts #3815L x #3815L and dust proof strike device #3911 - For metal doors over 20 minutes in rating, provide fire bolt #3850 (no bottom bolt or dust proof strike).	626/ 630	TR
1	Ea.	Storeroom-Type Lock	ND80TD x RHO x 10-025 (at rated pairs provide 3/4" latch throw)	626	SC
1	Ea.	Permanent Core	As required for locking devices. Before final lever style and/or permanent keying is submitted or ordered verify in field Client current keying system	626	SC
2	Ea.	Floor Stops	1214	626	TR
2	Ea.	Door Silencers	SR64 or SR65 (as required)	GR	IV
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents). At rated openings, provide 4031 x CUSH arm closers, S88 Seals and coordinator #3094 series x filler plates x mounting brackets as required.					

Hardware Group/Set #122

3	Ea.	Hydraulic Closers & Hinges	Heavy Duty SURE Close by D&D Technologies (per architectural details).		
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					

Hardware Group/Set #123

_	Ea.	Hinges (existing frame conditions)	T4A3786 heavy duty hinges or TA2714 medium duty hinges x 652 finish by McKinney manufacturing: - Verify in field existing frame preparation/templates and submit, furnish & install sized hinges to match existing frame. - Provide hinge width to enable door to open 175 degrees to hit stop. - Gap between doors, as well as between frame & doors at the head & jambs, to be no greater than 1/8".	652	MC
1	Ea.	Electrified Hinge	T4A3786 x QC6 (size to match top and bottom hinges per above)	652	MC
1	Ea.	Electrified Lockset	ND92T EU x RHO RX x 10-025	626	SC
1	Ea.	Permanent Core	As required for locking devices. Before final lever style and/or permanent keying is submitted or ordered verify in field Client current keying system	626	SC
1	Ea.	Surface Closer	4040XP x REG	689	LC
1	Ea.	Door Stop	1214	626	TR
1	Ea.	Seals	Provide seals at head & jambs: - If frame is hollow metal, furnish S88D seals (head & jambs) by Pemko or approved seal manufacturer. - If frame is aluminum, then seals are to be furnished by aluminum frame manufacturer (for sound dampening if non-rated opening, smoke or fire seals if rated conditions)		
1	Ea.	Auto Door Bottom	411APKL or 420APKL (as required per door material or wood or hollow metal) by Pemko or approved seal manufacturer.		
1	Ea.	Threshold	276A or per detail (sized to fit the condition) x FSL25 by Pemko or approved seal manufacturer.		
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required per Contract Documents: - The electrified hardware specified above can be utilized for #1) non-card reader, remote access control applications (unlocked / locked remotely for open during business hours / locked after-hours) and #2) local card readers at openings as directed by architectural drawings, security or electrical. - Coordinate with security or electrical Divisions 25-28 and applicable drawings as hardware does not include		

			card reader locations.
1	Ea.	Request-to-Exit Sensor (see free egress note in above specifications)	Parts/devices specified in above locking hardware (coordinate with divisions 25-28 and applicable drawings).
1	Ea.	Door Position Switches (also known as Alarm Contacts, Door Contacts or DPS devices)	If DPS devices are required by security or electrical, coordinate door & frame preparation/templates as required per Contract Documents (see Divisions 25-28 and applicable drawings). For pair doors template for two devices, single template for one device.
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).			

Hardware Group/Set #115

_	Ea.	Hinge	T4A3786 (size & quantity per 08 7100)	652	MC
1	Ea.	Rim-Type Exit/Panic Device x Keyed Lever Trim	CD 99L x 996L-R/V	630	VO
1	Ea.	I/C Cylinders (Rim or Mortise)	20-757 or 20-763 x appropriate cam x blocking rings as required (rim or mortise type & quantity as required by locking device)	626	SC
1	Ea.	Permanent Core	As required for locking devices. Before final lever style and/or permanent keying is submitted or ordered verify in field Client current keying system	626	SC
1	Ea.	Surface Closer	4040XP x EDA	689	LC
1	Ea.	Door Stop	1214	626	TR
1	Ea.	Seals	By door manufacturer.		
1	Ea.	Threshold	Per detail (sized to fit the condition)		
NOTE: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					

END OF SECTION 08 71 00

SECTION 08 71 13

AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Electric, swinging automatic entrances, full energy and low energy with concealed and surface mounting.
   2. Actuating controls and safety sensors at designated doors.

B. Related Requirements:
   1. All-Glass Entrances: Section 08 42 26.
   2. Aluminum-Framed Entrances: Section 08 42 13.
   3. Aluminum-Framed Storefronts: Section 08 43 13.
   4. Door Hardware: Section 08 71 00.
   5. Electrical: Division 26; rough in, wiring and connectors for hardware.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures and as specified in this Section.
   2. Maintenance Materials Submittals and Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

B. Coordination:
   1. Examine the Contract Documents and furnish proper hardware for door openings. Examination includes, but is not limited to, the following:
      a. If hardware Groups are missing fire or smoke rated required devices, provide all devices to meet codes.
      b. The hardware groups/sets specified in Section 08 71 00, Part 3 are intended to establish type and design standard when used together with the requirements of this Section, Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections. Examine Contract Documents and furnish proper hardware for door openings. Refer to specifications for clarification and detailed requirements and provide products and services in specifications even if not written in hardware groups/sets in Sections 08 71 00 and 08 71 13, Part 3.
   2. Coordinate work of this Section with other directly affected Sections involving manufacturer of any internal reinforcement for door hardware.
      a. In particular, coordinate door preparation in accordance with applicable regulatory and trade standards specified.

b. Review details and conditions prior to ordering material. If door hand is changed during construction, coordinate and change hardware as necessary at no cost to the County.
c. Coordinate Keying requirements as specified in this Section.

3. Submit templates and hardware schedule reviewed by County's Representative to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.
4. Send Installation Instructions to site with hardware.
5. Convene coordination meeting between all opening vendors & installers at least two weeks prior to purchasing doors, frames, door hardware and electrical devices required for complete systems.
   a. Required attendance includes but is not limited to the following: Contractor; hardware supplier and/or installer; door supplier and/or installer; frame supplier and/or installer; auto operator vendor and/or installer; and electrical.
   b. Contractor shall be responsible for verifying that the door hardware accepted for installation is compatible for use with the doors and door-frames.
   c. For auto operator interface with applicable door devices, auto operator vendor and/or installer (coordinate accordingly) to have a written agenda and plan on how scope related to electrified devices will be installed to have a complete wired and operational auto operator system. The auto operator interface scope includes but is not limited to connectivity & inputs for push-plates, BEA BR3 (or approved equal required auto operator relays), electric locking devices, as well as confirmation of the complete, wired and operational auto operator system. Provide all required relays & devices as part of the overall system in accordance system requirements at no additional cost to County.
   d. Vendor and/or installer (coordinate accordingly) not responsible for electrical-power (see electrical drawings).
6. Pre-Installation Meeting. Conduct a coordination meeting prior to purchasing doors and door frames. Require attendance of the following: Contractor, County's Representative, electrical/security scope for doors, hardware supplier, door supplier and frame supplier.

1.3 ACTION SUBMITTALS

A. Pre-Hardware Schedule:
   1. Report all prevailing conditions that will adversely affect satisfactory execution of work. Examine existing doors and/or frames scheduled for hardware replacement.

B. Submit a detailed door and hardware schedule according to the following:
   1. Hardware Schedule:
      a. Submit via electronic PDF in vertical format as illustrated by the Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Schedules which do not comply will be returned for correction

before checking. Horizontal-type schedules will be returned for correction before checking.

b. Hardware schedule shall clearly indicate County's Representative's hardware group and manufacturer of each item proposed.

C. Product Data:
1. Illustrations from manufacturer's catalogs and data in brochure form.
2. Include labeling and listing information in accordance with the IBC and NFPA 80 for fire rated and smoke-type doors.

D. Templates: Provide listing of manufacturer's template numbers for each item of hardware in hardware schedule.

E. Installation Instructions: Provide manufacturer's written installation and adjustment instructions for finish hardware.

F. Samples:
1. Full-size operating hardware in specified finish when requested by the County's Representative.
2. Affix labels to sample fully to identify manufacturer, class, type, and Project.
3. After review, accepted samples may be obtained from County's Representative for installation on the Project. Pick up samples within 7 days of notification of acceptance or rejection.

1.4 INFORMATIONAL SUBMITTALS

A. Supplier qualifications as specified.

1.5 CLOSEOUT SUBMITTALS

A. Provide operating and maintenance manual that includes the following:
1. Complete information in care, maintenance, and adjustment, and data on repair and replacement parts, and information on preservation of finishes.
2. Catalog pages for each product.
3. Name, address, and phone number of local representative for each manufacturer.
4. Parts list for each product.
5. Copy of final approved hardware schedule, edited to reflect "As installed."

B. Maintenance materials as specified.

1.6 QUALITY ASSURANCE

A. Operator Device Supplier Qualifications: Firm specializing in the supply and servicing of institutional and commercial low energy operator devices and sliding automatic doors; accredited by manufacturers; and having a minimum of 3 years documented experience. Hardware supplier to furnish list of at least 10 completed

projects complete with date competed, project location and project contact information.

B. Manufacturer Qualifications and Documentation:
   1. Operator Device Manufacturer Qualifications: Manufacturer specializing in manufacturing institutional and commercial high and low energy operator devices with a minimum 5 years with the following documented experience. Furnish list of at least 10 finished projects. Include date competed, project location and references (past project contact information to determine if commercial high and low energy operator devices are acceptable).
   2. Manufactured devices submitted must have a factory certified central dispatch service for warranty. System to be available 24 hours a day, 365 days per year to obtain malfunction information and dispatch appropriate service agency to the customer location.

C. Installer Qualifications and Documentation:
   1. Company specializing in installing the products specified in this Section shall have minimum ten years' experience and be a member of the American Association of Automatic Door Manufacturers (AAADM). A completed AAADM compliance form shall be submitted as proof of compliance with current ANSI/BHMA 156.19 American National Standard for power high and low energy operated doors as well as high energy operators. Doors shall be inspected and form shall be signed by an AAADM certified inspector prior to placing doors in operation.
   2. Operator Device Installer qualifications: The installer of assembly shall be trained in the trade of installing and start-up of commercial high or low energy operator devices and sliding automatic doors. Supplier and Installer of door assemblies shall be authorized representative of manufacturers and have minimum of 5 years successful experience in detailing, supplying and installing commercial high and low energy operator devices and sliding automatic doors specified on projects of similar size, complexity and type to this Project.
   3. Local certified distributor to install operator in accordance with current ANSI/BHMA 156.19 American National Standard for High and Low Energy Power Operated Doors and local applicable codes. For low energy applications, local certified distributor to install operator in accordance with ANSI 156.19, ANSI 117.1, NFPA 101 and local applicable codes.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hardware to factory, shop, or mill of subcontractors and manufacturers requiring it or directly to the Project site as required.

B. Each article of hardware shall be individually packaged in manufacturer's original container, properly marked or labeled in conformity with the reviewed Hardware Schedule.

C. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 66 00 Delivery, Storage and Handling.

1.8 WARRANTY

A. Unless otherwise specified below, furnish to County a written manufacturer's 2 year extended guarantee for automatic door operators against defects in materials and workmanship.

1.9 MAINTENANCE MATERIALS

A. Provide special wrenches and tools applicable to each different or special component.

B. Provide maintenance tools and accessories supplied by manufacturer.

C. Maintenance Data: Submit two copies of operator maintenance manuals that include the following items:
   1. Lubrication instructions.
   2. Operator maintenance instructions.
   3. Capability of servicing by local firm. List name, address and phone number of firm.

PART 2 - PRODUCTS

2.1 MATERIALS: GENERAL REQUIREMENTS

A. The Specifications are intended to cover all doors in the Project and establish a type and standard of quality, but it is the responsibility of the Contractor to furnish proper hardware for all openings and for a complete installation. Where Hardware Groups/Sets have different information refer to the following specifications for clarification and detailed requirements (provide all devices whether specified or not in hardware sets/groups).

2.2 LOW ENERGY AUTOMATIC OPERATOR DEVICES

A. Overhead surface or concealed mounted devices:
   1. Furnish 4-1/2" wide by 6" tall devices only.
   2. Furnish and install UL rated 4000LE/4900LE low energy operators by Horton manufacturing. 4000LE series is acceptable at fire or smoke rated opens as long as UL smoke and fire rating information is attached to 4000LE device and factory 8-1/2" x 11" UL listed information is part of the submittal and site work process.

B. Products by the following manufacturers will be considered for approval providing operator can open 400 pound or heavier door (whether or not doors on this project are 400+ pounds) all specified criteria have been met in full. Furnish all items and

components of hardware required to complete the work in accordance with specifications, Contract Documents and intended operation:

1. La Force / Horton manufacturing.
2. Stanley Magic.
3. ED400 Series by Dorma Manufacturing.

C. Contract directly with member of the American Association of Automatic Door Manufacturers (AAADM, not as a sub-contract to the door supplier).
   1. Contact 1: Automated Services and Products, Inc. http://www.asapdoors.com (510) 658-2727
   2. Contact 2: Capitol Door Service - Northern California http://www.capitoldoors.com/cb-nc-home.htm (800) 783-1163
   3. Contact 3: Automatic Door Systems, Inc. www.autodoorinc.com / 800.592.8282

2.3 ADDITIONAL DEVICES:

A. Where Hardware Groups/Sets have different information refer to the following specifications for clarification and detailed requirements:

B. Provide required relays and devices as part of the overall system in accordance system requirements. Units shall have relay contact for interfacing products. Door operator shall have input line rating of 120VAC.unit shall have an internal circuit breaker switch to interrupt input power for servicing. Unit shall be U.L. Listed for automatic closing door. Unit shall be in compliance with the requirements of the Americans with disabilities act (ADA) and ANSI standards a117.1 and A156.19.

C. Provide adjustment for opening, closing, and checking speeds, as well as length of time door remains open. Provide units that can be utilized as a hold open devices (door placed in opened position when device three-way switch is engaged to “hold open” position.

D. Provide Automatic Operators with external “On/Off switch” as part of overall/complete system.
   1. Low energy operator manufacturer to have hold open keyed rocker as part of overall system and installed on auto operator external body above frame (door placed in opened position when keyed rocker three-way switch is engaged to “hold open” position (On/Off/Hold Open). Basis of design (example only): LCN Rocker switch #8310-806R, type 3 position (on/off/hold-open), but coordinate with Auto Operator manufacturer to verify correct keyed rocker switch size and type for Operators installed.
   2. Where pairs of doors have two separate Automatic Operators provide one external On/Off/Hold-Open three-way switch to operate both doors/operators.

E. Relays, timer, and logic modules Devices:
   1. At all auto door operators locations, provide BEA device # BR3 relay, timer, and logic modules (required for interface to indicated security components; and shall be assembled, connected, and fully contained within the power supply enclosure).

F. Push Plates, Touch-Activated Automatic Door Controls and Safety Sensors:
   1. Provide Automatic Operators devices with external Actuators (Push-Plate devices) to be utilized at doors where indicated in drawings and as scheduled. Push-and-Go type features are not acceptable.
   2. Acceptable Manufacturers: Wikk Industries, Inc., Greendale, WI, 877-421-9490, or equal.
   3. Products:
      a. Bar Actuator: Wikk Touch-Activated "INGRESS'R" device as scheduled, or equal.
      b. Bollard Mounting: see hardware group/sets
   4. Where Hardware Groups/Sets have different information refer to the following specifications for clarification and detailed requirements:
      a. Furnish and install touch-activated automatic door controls with Micro-Switches: double pull, double throw, dry-contact, and momentary-action micro-switch.
      b. Furnish and install touch-activated automatic door controls with Micro-Switches: single-pole, double-throw, dry-contact, momentary-action micro-switch.
      c. Furnish and install touch -activated automatic door controls in dark anodized finishes with international symbol of accessibility and lettering "push to open" engraved and applied in permanent blue enamel.
      d. Mounting: flush-type compatible with touch-activated automatic door controls. Provide complete installation brackets or adapters for automatic operator actuators to suit application.
      e. Provide weather resistant devices with no gaps for water or ice to penetrate.
   5. Safety Sensor Devices:
      a. Design basis of design - device #OPTEX Pro-Swing Elite #OA-603BL x OC904C x required relays.
      b. Safety sensor devices installed on door as shown below:

         Safety sensor devices are not to be utilized for opening sensors (opening actuation by wall mounted push plates or separate infrared presence sensor as scheduled).
      c. Sensor devices are to be active infrared presence/safety sensor. The function of device is to protect the door from closing on a person or object in the swing-area detection zone.
      d. Provide additional lockout module devices as required as some of the newer auto operator device manufacturers have a built in lockout (provide a fully functional system to meet design intent). Lockout module is typically determined by the door controller/control box).
      e. Provide installation back plates and devices as required for each type of door/frame condition:

2.4 POWER SUPPLIES

A. Where Hardware Groups/Sets have different information (number of wires and missing power supply devices and information) refer to the following for clarification and submit according to complete and intended electrified system.
   1. Coordinate use of power supplies with door and frame locations. Provide power supplies, relays and battery backup units as part of the overall system in accordance with the manufacturer's warranty and system requirements.
   2. Output shall be filtered and regulated. Relay, timer, and logic modules shall be provided as required for interface to indicated security components; and shall be assembled, connected, and fully contained within the power supply enclosure.

2.5 FASTENINGS

A. Fastenings shall match hardware material and finish.

B. Use screws, bolts, washers, grommets, nuts, and other fastening devices of appropriate size, length, type, head, metal and finish as necessary for proper match and application of hardware Machine screws and tamping shields for attaching hardware to concrete, stone, or masonry.

C. Provide nonferrous or corrosion-resistant steel fasteners exposed to weather.

2.6 FINISHES

A. Exposed Items:
   1. Interior: Satin chrome 626 (US26D).
   2. Exterior: Satin stainless steel US32D (630).

B. Painted finishes: Factory-painted finish to match adjacent hardware finish, unless specified or scheduled otherwise.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The operator installer shall examine the areas and conditions under which the automatic operators are to be installed, and notify the County's Representative in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until satisfactory conditions have been corrected.

B. Measurements: Verify all dimensions by taking field measurements before any material is fabricated and shipped to the job site.

3.2 INSTALLATION

A. Install all devices in accordance with manufacturer's printed instructions and approved shop drawings. Install all devices level and plumb.

B. In-Ground Low Energy Auto Operator device shall have blocking (cement or metal case are acceptable) in floor slabs before cement is poured. Additional In-Ground Low Energy Auto Operator device materials to be delivered and installed with remainder of hardware.

C. Projecting Items: Install or re-install wrappings furnished by the manufacturer.

D. Sealants: Furnish and install all sealants indicated or required to complete installation in accordance with Section 07 9200, "Joint Sealants."

E. Install equipment per current ANSI/BHMA A156.19 American National Standard for Power Assist and Low Energy Power Operated Doors and as directed by American Association of Automatic Door Manufacturers (AAADM) recommendations.

F. Push plates and touch-activated automatic door controls:
   1. Install touch-activated automatic door controls at mounting height 3 inches above finished floor or as indicated on the Drawings.
   2. Mount touch-activated automatic door controls securely in place to supports with fasteners supplied by manufacturer.

3.3 TESTING, ADJUSTING AND INSPECTION

A. Repair or replace installations which do not perform according to manufacturer's printed instructions and approved shop drawings.

B. Adjust parts for smooth, uniform operation. Lubricate moving parts with manufacturer recommended lubricant. Replace units that cannot be adjusted and lubricated to operate freely and smoothly as intended for the application.

C. Adjust door closer devices (inner unit within auto operator devices):
   1. Adjust closer operating effort to conform to ADA.
      a. Interior and Exterior Doors: Not to exceed 5.0 pounds force.
      b. When fire doors are required, the maximum effort to operate the door may be increased to the minimum allowed by the appropriate administrative authority, not to exceed 15 pounds opening force.
   2. Adjust closer delay and operating speeds to comply with requirements of the Americans with Disabilities Act Architectural Guidelines, Article 4.13.10.
      a. Door closers shall be adjusted so that from an open position of 90 degrees, the time required to move the door to a position of 12 degrees from the latch is 5 seconds minimum.

3.4 CLEANING

A. After repeated operation of completed installation, readjust door operators and controls for smooth, quiet and optimum operating condition and safety. Clean surfaces promptly after installation. Provide protective treatment and other precautions required

through the remainder of the construction period to ensure that automatic operators will be without damage or deterioration.

B. Defective Work: Remove and replace any defective work that cannot be properly repaired, cleaned or touched up.

C. Just prior to final acceptance of building or as directed, remove protective paper coverings and clean and polish hardware.

3.5 HARDWARE GROUPS

A. Manufacturer Abbreviations:

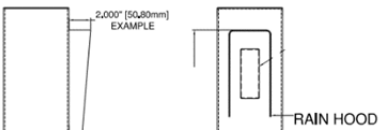
Manufacturer	Abbreviation
Tormax	TO
BEA Manufacturing	BE
Optex	OP
Wikk Manufacturing	WI

B. Hardware Columns - Example (Legend):

Qty	Device Description	Device # (include specification language)	Finish
	Manu		
1	- - - - - - - - - - - -	- - - - - - - - - - - -	- - - - - -

C. The following hardware sets are intended to establish type and standard of quality when used together with the requirements of this Section.
   1. Examine Contract Documents and furnish proper hardware for door openings.
   2. Refer to Door Schedule on the Drawings for Hardware Group/Set assignments for each opening.
   3. Blank space below and after a Group/Set is intentional to avoid, if possible, splitting a Hardware Group/Set onto two pages.

Hardware Group/Set #01

In addition to the devices specified in hardware group/set below, also coordinate devices in specification Section 08 71 00 "Door Hardware" (furnish & install doors, frames and related scope per complete Contract Documents):					
1	Ea.	At LHR Door only, Provide Above Frame, Low Energy Operator System	Horton (HO) #4000LE, 4-1/2" wide x 6" tall, offset hung, single acting). Provide operator only at the left hand reverse door (LHR)		
2	Set	Surface Mount Bollard x Push-Plate/Actuator 	Furnish & install Bollard RT1 14"X3.5"x 48" Tall, x 7ga. Formed 304 Satin Stainless Steel US32D (630), Removable bollard for concealed sleeve (CS) and base plate with 7" bolts for mounting, 2 Preps for Card reader and Ingress'r model #I36-5 devices (hardwired, stainless steel with blue wheelchair logo and added text "PUSH TO OPEN" x welded flat top x round smooth with no visible edges x card reader rainhood (example rainhood below):		
1	Ea.	Relay Device (or submit approved relay by auto operator vendor)	Provide BEA BR3, 10-BR3 or equal relay: operator vendor/installer to interface inputs / outputs		BE
_	Ea.	Door Position Switches (also known as Alarm Contacts, Door Contacts or DPS devices)	If DPS devices are required by security or electrical, coordinate door & frame preparation/templates as required per Contract Documents (see Divisions 25-28 and applicable drawings).		
2	Ea.	Request to Exit Device (see free egress note in above specifications)	By security (coordinate with divisions 25-28 and applicable drawings)		
1	Ea.	Coordination task for security and/or electrical design and additional non-Division 08 Section scope (including but not limited to wire / connectivity from ground or ceiling through frame to electrified hardware)	By security or electrical as required per Contract Documents: - The electrified hardware specified above can be utilized for #1) non-card reader, remote access control applications (unlocked / locked remotely for open during business hours / locked after-hours) and #2) local card readers at openings as directed by architectural drawings, security or electrical. - Coordinate with security or electrical Divisions 25-28 and applicable drawings as hardware does not include card reader locations.		
Note 1: Balance of perimeter seals and meeting stiles by door manufacturer. Note 2: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices requirements in the above specification language, architectural plans & full specification documents).					

END OF SECTION 08 71 13

SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Glass and glazing materials.
2. Unframed mirrors.
3. Translucent resin glazed partition system.
4. Applied window films.

B. Factory-glazed window and door units shall conform to the requirements of this Section.

C. Related Requirements:
1. Metal Fabrications: Section 05 50 00; supports and anchors for glazed assemblies.
2. Decorative Metal: Section 05 70 00; glass railing assemblies.
3. Decorative Plastic Paneling: Section 06 64 00; performance requirements for translucent resin glazing used in partition system.
4. Joint Sealants: Section 07 92 00.
5. Wood Doors: Section 08 14 00.
6. Aluminum-Framed Entrances: Section 08 42 13.
7. All-Glass Entrances: Section 08 42 26.
8. Aluminum-Framed Storefronts: Section 08 43 13.
9. Visual Display Surfaces: Section 10 11 00; glass marker boards.
10. Demountable Wall System: Section 10 22 19; glass used as part of demountable wall system.
11. Toilet Accessories: Section 10 28 13; framed mirrors.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

B. Attendance is required at preconstruction meetings specified in related Sections.

C. Coordinate with work of other Sections
1. For weathertight installation at interface with exterior materials and systems.

2. For support and anchorage of metal-framed, translucent resin glazed partition systems.

1.3 ACTION SUBMITTALS

A. Shop Drawings: As specified in related Sections for systems in which glazing is installed.

B. Product Data: Manufacturer's literature for all materials proposed for use, substantiating that glass and glazing materials comply with specified requirements.

C. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 4:
         1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
         2) Statement or vendor’s invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
         3) Cut sheets or manufacturer’s technical data sheet indicating levels of recycled content for each material having recycled content.
      b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.
      c. Credit EQ 4.1: Manufacturer’s MSDS or technical data sheet showing a printed statement of VOC content for field-applied adhesives and sealers used inside of the weatherproofing barrier of the building demonstrating compliance with SCAQMD Rule #1168.
      d. Credit EQ 8.1: Manufacturer’s documentation for visible light transmission of each exterior glass Type.

D. Samples:
   1. Glass and Translucent Plastic:
      a. Sample, 12 inches square, of each type, color, and design specified, except clear single-pane units.
      b. Samples of insulating glass shall be constructed from same material and by method as to be installed in Project.
   2. 12-inch-x-12-inch piece of each type of window film applied to proposed glass.

3. Sealants and Gaskets:
   a. Sample, 12 inches long, of each type of sealant and gasket, including molded corners, exposed to view.
   b. Install sealant or gasket sample between two strips of material representative of adjoining framing system, in color.
4. Samples may be submitted as part of sample submittals required under other Sections.

1.4 INFORMATIONAL SUBMITTALS

A. Statement of fabricator/installer qualifications for exterior glazing.

B. Statement of fabricator/installer qualifications for translucent resin glazed partition system.

C. Statement of qualifications for applicator of applied film.

D. Product Certificates and Statements:
   1. Insulating Glass: Certification that units meet IGMA Class CBA requirements.
   2. Mirrors: Certification that mirrors meet requirements of the Safety Glazing Certification Council (SGCC).
   3. Sealants: The following statements for the installation:
      a. Statement signed by installer and Contractor, that sealants installed comply with Specifications and that installation methods comply with manufacturer's written instructions for each condition of installation and use on this Project.
      b. Structural Sealant: The following from the manufacturer:
         1) Compatibility: Materials in contact with structural sealant are compatible therewith after 21 days' exposure to ultraviolet light (2000 to 4000 microwatts of UV radiation).
         2) Stress: Joint dimension, when subjected to 1.5 times specified wind load pressure and seismic drift, will not cause sealant stress to exceed 20 psi, with a safety factor as recommended, in writing, by sealant manufacturer.

E. Test Reports:
   1. Statement from sealant manufacturer indicating that glass and glazing materials have been tested for compatibility and adhesion with glazing sealants and interpreting test results relative to material performance, including recommendations for primers and substrate preparation needed to obtain adhesion.
   2. Product test reports from a qualified independent third party testing agency indicating each type and class of resin panel complies with project performance requirements, based on comprehensive testing of current products. Previously completed test reports will be acceptable if for current manufacturer and indicative of products used on this project.

F. Design Calculations for Exterior Glass: Demonstrate compliance with applicable codes and specified structural and deflection requirements. Calculations shall be by a structural engineer licensed in the State of California.

G. Where conformance with specified deflection criteria results in different thickness of glass in the same building elevation, it shall be brought to the attention of the County's Representative in writing so that options for dealing with resulting different appearance can be considered.

1.5 CLOSEOUT SUBMITTALS

A. Extended warranties as specified.

B. Cleaning and maintenance instructions for applied window films.

1.6 QUALITY ASSURANCE

A. Qualifications
   1. Fabricator/Installer of Exterior Glazing: Company specializing in work of this Section, with documented experience on jobs of similar type and complexity.
   2. Fabricator/Installer of Translucent Resin Glazed Partition Systems: Trained and certified by system manufacturer.
   3. Applicator of Applied Window Film: Approved by film manufacturer.

B. Regulatory Requirements:
   1. Comply with CBC Chapter 24, Section 2406.
   2. Where safety glass is indicated or required, provide type of products indicated that comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category I or II materials, as applicable.
   3. Mirrors shall meet CPSC or ANSI safety glazing requirements and shall be certified by the Safety Glazing Certification Council (SGCC).

C. Industry Standards:
   1. Insulating glass shall be certified under a certification program approved by the Insulating Glass Manufacturers Alliance (IGMA).
   2. Comply with GANA "Glazing Manual," except where more stringent requirements are indicated.
   3. Comply with applicable provisions of the AAMA "Metal Curtain Wall, Window, Store Front and Entrance Guide Specifications Manual."

D. Minimum Wind Load for Exterior Glass and Glazing Assemblies: In accordance with CBC Chapter 16.

E. Mockups:
   1. First installed example of each type of translucent resin panel system, and each installation condition, shall serve as a mockup for review by County's Representative of workmanship, visual effect, and interface with adjacent construction.
   2. Provide glazing for mockups specified in related Sections.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver glass and plastic with manufacturer's label indicating type, quality, and thickness on each piece.

B. Protect glass, plastic, and glazing materials during delivery, storage, and handling so as to comply with manufacturer's directions and as required to prevent face and edge damage to glass and damage to glass and glazing materials from effects of moisture, including condensation and other causes.

C. Additional requirements for plastic panels are specified in Section 06 64 00 Decorative Plastic Paneling.

D. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

1.8 WARRANTY

A. Manufacturers:
   1. Insulating Glass: Written warranty for sealed insulating glass unit in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period.
      a. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions
      b. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
      c. Warranty Period: 10 years.
   2. Laminated Glass: Manufacturer's standard 10-year warranty in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period.
      a. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions.
      b. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

3. Coated-Glass Products: Manufacturer's standard 10-year warranty in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period.
   a. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions.
   b. Defects include peeling, cracking, and other indications of deterioration in coating.
4. Translucent Resin Panel System: Manufacturer's standard 2 year warranty agreeing to repair or replace units that fail in material or workmanship.

B. In addition, warranty requirements of related Sections for systems in which glazing is installed shall apply to work of this Section.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE REQUIREMENTS

A. Provide watertight and airtight installation of each piece of exterior glass and sealed glass unit.

B. Each installation shall withstand local normal thermal movement, temperature changes, wind loading, and impact loading (for operating sash and doors) without failure of any kind, including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, loss of hermetic seal, deterioration of glazing materials, and other defects.
   1. Normal thermal movement is defined as that resulting from an ambient temperature range of 120 degrees F and from a consequent temperature range within glass and glass framing members of 180 degrees F.

C. Comply with applicable design and performance requirements of related Sections for systems in which glazing is installed.

D. Deflection Criteria: Glass center deflection at code required design load shall not exceed 3/4 inch.

E. Design and Performance Requirements for Translucent Resin Panel System: As specified in Section 06 64 00 Decorative Plastic Paneling.

2.2 GLASS MATERIALS

A. General: Except as otherwise specified, minimum thickness shall be 1/4 inch unless greater thickness is recommended by fabricator for size of light and design criteria.
   1. Where multiple sizes occur in a glazed element or assembly, provide a uniform glass thickness where the thickest required glass shall govern throughout.

B. Annealed Float Glass: ASTM C1036, Type I, Class 1, Quality q3 or better.

C. Heat-Strengthened and Tempered Float Glass: ASTM C1036, Type I float glass as specified above and conforming to requirements of ASTM C1048 and as specified.
   1. Tempered glass shall meet ANSI Z97.1 test requirements.
   2. Glass shall be tempered using the roller hearth method.
   3. Heat-strengthened glass shall have surface compression levels between 3500 and 7000 psi.

D. Spectrally Selective Glass: Clear float and tempered glass as specified above with a spectrally selective Low-E coating that will provide highest visible transmittance, lowest shading coefficient, and high UV radiation blockage; "Sungate 100 Selective Low-E" by PPG Industries, "LoĒ^2 272" by Cardinal Glass Industries, or equal.

E. Clear Tempered Float Glass for Shelves and Transaction Surfaces; ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3; with exposed edges seamed before tempering, thicknesses as indicated.

F. Laminated Glass: Two lights of 1/8-inch-thick, clear, heat-strengthened glass as specified, with plastic-film interlayer meeting criteria of ANSI Z97.1 and CPSC 16 CFR 1201 for safety glazing.
   1. Interlayer shall be polyvinyl butyral (PVB) or equal with minimum 99.6 percent UV filtration; “Saflex” by Solutia Inc., or equal.
      a. Thickness: 0.030 inch.
      b. Color: Clear.

G. Laminated Glass at Marker Boards: Two lights of 1/8-inch-thick clear glass with opaque, white, plastic film interlayer; Wilkinson Architectural Products #MG7792 or equal; with white, opaque, film backing, Madico #MT-200.
   1. Coordinate with Section 10 11 00 Visual Display Surfaces.

H. Solar Control Low-E Insulating Glass: Float and tempered glass as specified above with a Low-E coating; “Solarban 80” by PPG, or equal. Glass to be certified under IGMA-approved program and meet Test Class CBA requirements when tested in accordance with ASTM E773 and ASTM E774.
   1. U-Value: 0.29.
   2. Solar Heat Gain Coefficient (SHGC): 0.23.
   3. Shading Coefficient: 0.27.
   4. Visible Light Transmission: 47 percent.
   5. Outdoor Visible Light Reflectance: 32 percent.
   6. Thickness: 1 inch.
      a. Exterior Light: Clear, sputter coated on surface 2, 1/4-inch thick.
      b. Air Space: 1/2 inch.
      c. Interior Light: Clear, 1/4-inch thick.
   7. Spacer Frame: Aluminum filled with desiccant, with soldered corners.
      a. For Clear Glass: Mill finish.
   8. Primary Sealant: Polyisobutylene.
   9. Secondary Sealant: IGS 3204 two-part silicone sealant by GE or Dow-Corning.

I. Clear Mirror Glass: ASTM C1503, Select quality, 6.0 mm thick.
   1. Provide silver coating, copper-protective coating, and 1-mil-thick mirror backing paint.
   2. Comply with CS 27.

2.3 GLASS TYPES

A. G1: Clear, annealed float, 1/4 inch thick.

B. G1.1: Clear, tempered float, 1/4 inch thick.

C. G2: Insulating glass, clear.

D. G2.1: Insulating glass, clear, tempered.

E. G2.2: Insulating glass, clear, laminated.

F. Additional Glass Types: To be selected by County's Representative.

2.4 TRANSLUCENT RESIN PANEL PARTITION SYSTEM:

A. Manufacturer: 3form, Inc., Salt Lake City, Utah, USA / telephone 801-649-2500; or equal.

B. System: "Ready to Go Partition 200.08."
   1. Materials: Varia™ produced from ecoresin™ Sheet; polyethylene terephtalate, glycol (PETG) modified resin sheet laminated to a decorative interlayer.
      a. Engineered polyester resin.
      b. Panel Sizes and Configurations: As indicated on the Drawings.
      c. Thickness: Minimum 3/8 inch.
   2. Interlayer Materials: Compatible with polyesters and bonding process to create a monolithic sheet of material when complete.
   3. Colors and Designs: As scheduled in Appendix A, "Product and Finish Schedule," in sizes and arrangements shown on the Drawings.

C. Cable Framing and Support System: "3Form 200.08.01 SC Ready to Go Solution System" as shown on the Drawings.
   1. Provide manufacturer's accessories as shown or required, including but not limited to structural anchors, floor anchors, ceiling cover plates, and panel clips.

D. Additional Framing and Support Systems: As shown on the Drawings and specified in other Sections.
   1. Interpoles and related items, where indicated as "by others," are part of County's furniture system and will be provided under separate contract.

E. Coordinate with other Sections for support and anchorage at floor and ceiling.

2.5 GLAZING MATERIALS

A. Sealants for Glazing:
   1. Interior Locations, If Not Dry Glazed: One-part, gun grade; Tremco "Mono," Pecora "60 Plus," or equal.
   2. Exterior Locations: One-part, gun-grade silicone; Momentive Performance Materials "SCS-1200," Dow-Corning "999 Building Sealant," or equal.
      a. Color: Black.
   3. Silicone Sealant at Butt Glazing: Dow-Corning "795," Momentive Performance Materials "SCS2000 Silpruf," or equal.
      a. Color: Black.

B. Joint Backer: Diameter size at least 25 percent larger than joint width; type and material as recommended, in writing, by glass and sealant manufacturer.

C. Silicone Glazing Materials: Provide silicone setting blocks, jamb blocks, and sealant joint backer or spacers in lieu of neoprene, if recommended by sealant manufacturer, for compatibility with sealant. Corners, sizes, profiles, and color as specified for neoprene glazing materials.

D. Glazing Blocks and Spacers: Closed-cell neoprene complying with ASTM C509, in black color.

E. Glazing Gaskets: As specified in Section 08 43 13 Aluminum-Framed Storefronts and other related Sections.

F. Glazing Tape: Butyl rubber type, black color; Pecora "Extru-Seal Tape G-66," Tremco "440 Tape," or equal.

G. Mirror Channels: Stainless steel, matched set of bottom and top channels, width to match glass thickness.

H. Aluminum Glazing Channel:
   1. Shape: As indicated on the Drawings.
   2. Size: As required for stability of glass size installed.
   3. Finish: Mill.

I. Mirror Adhesive: "Mirro-Mastic" by Palmer Products Corp. or equal warranted for 5 years.

J. Accessory Materials: Miscellaneous clips and fastenings as required and as standard with window or door manufacturer.

2.6 ADDITIONAL MATERIALS

A. Applied Decorative Film: 3M "Scotchcal" as distributed and applied by Window Solutions, Foster City, CA, or accepted equal dealer/applicator approved by 3M.
   1. Pattern, Color, and Appearance: As scheduled on the Drawings, or, if not scheduled, as selected by County's Representative.

2.7 FABRICATION

A. Glazing framing dimensions shall provide for necessary minimum bite on glass, minimum edge clearance, and adequate sealant thicknesses, with reasonable tolerances. Provide correct glass size for each opening, within tolerances and necessary dimensions established.

B. Factory-label each pane of glass. Do not remove labels until final acceptance is obtained.

C. Tempered glass shall be horizontally tempered with roller ripples in horizontal direction.
   1. Where required, include an inconspicuous but visible permanent identifying label on each pane in accordance with ANSI Z97.1.
      a. Fused to glass and located in a lower corner.
      b. Include manufacturer's name or trademark, glass type, thickness, and designation of treatment.
   2. Maximum warpage in accordance with Pilkington or PPG standards.
   3. Provide fireman's tempered-glass marker where required by local fire department.
   4. Provide cutouts for fittings and hardware where indicated.

D. Edges at butt-joint glazing and other exposed edges shall be flat ground with a 1/16-inch ground 45-degree seam and polished, unless otherwise indicated on the Drawings.

E. Clear glass for shelves and transaction surfaces shall be fabricated from specified tempered glass with exposed edges seamed before tempering, thicknesses as indicated.

F. Dimensional Tolerances: Glass shall comply with referenced standards, except for the following:
   1. Edge bow in open- or closed-joint, butt-glazed situation shall not cause misalignment of adjacent panels in excess of 1/8 inch.
   2. Width of joint dimension shall not vary within any butt joint by more than 1/16 inch.
   3. Width of joint dimension shall not vary from nominal dimension by more than 1/16 inch.

G. Organic-Coated Mirrors: Provide backing tape on back of mirrors that are less than 36 inches above finished floor so as to keep glass fragments together should mirrors be accidentally shattered; "CRL" shatterproof safety tape as manufactured by C.R. Laurence Co., 800-421-6411, or equal.
   1. Taped mirrors shall comply with 16 CFR 1201, ANSI Z97.1 and CBC [___] for impact testing as a Category I or II as required by installation.
   2. Grind smooth all exposed edges.

PART 3 - EXECUTION

3.1 GLAZING

A. Comply with combined printed recommendations of glass manufacturers and manufacturers of sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.

B. Tempered Glass: Provide at locations where indicated and required in accordance with regulatory requirements.

C. Protect glass from edge damage during handling and installation.
   1. Use a rolling block in rotating glass units to prevent damage to glass corners.
   2. Use suction cups to shift glass units within openings.
   3. Do not raise or drift glass with a pry bar.
   4. When glass has flares or bevels along one horizontal edge that would occur in vicinity of setting blocks, install with flares or bevels at top of opening.
   5. Use glazing tape and shims to position glass properly.

D. Remove and dispose of glass with edge damage or other imperfections of any kind that, when installed, would weaken glass and impair performance and appearance.

E. Install setting blocks of proper size at sill, located one-quarter of glass width from each corner, unless otherwise required. Set blocks in sealant acceptable for heel bead use.

F. Provide edge blocking to comply with requirements of GANA "Glazing Manual," except where otherwise required by glass fabricator.

G. Set units in each series with uniformity of pattern, draw, bow, and similar characteristics.

H. Compression Gaskets: Provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement.
   1. Miter-cut at corners. Install as recommended by gasket manufacturer to prevent pull-away at corners.
   2. Seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3. Install gaskets to protrude slightly out of channel so as to eliminate dirt and moisture pockets.

I. Butt Glazing Sealant:
   1. Clean glass, using solvents, to remove contaminants, glazing compounds, and protective coatings.
      a. Do not use detergent or soap and water.
      b. Use a clean oil- and lint-free rag.
   2. Tool sealant for uniform appearance.
   3. Remove excess sealant from glass and metal prior to cure, using xylol, toluol, or MEK.
   4. At porous surfaces remove sealant after initial cure, using mechanical means.

J. Mirror Adhesive: Apply in accordance with manufacturer's recommendations over primer/sealer on substrate.
   1. Do not apply over water-resistant gypsum board that has not been primed.
   2. Install to allow 1/8-inch space between back of mirror and surface of wall.
   3. Use specified channels to support unframed mirrors at lower and top edge. Do not rest mirrors directly on countertop backsplashes or tile.

K. Applied Films: Apply in accordance with manufacturer's specifications.
   1. Film edges shall be cut neatly and square to a uniform distance of 1/8 inch to 1/16 inch of the window seating device.
   2. Within 30 calendar days of application, film shall show no moisture dimples when viewed under normal viewing conditions.

3.2 PROTECTION AND CLEANING

A. Do not apply markers to surfaces of glass.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.

C. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in other ways during construction period, including natural causes, accidents, and vandalism.

D. Remove nonpermanent labels, and wash glass on both faces by method recommended by glass manufacturer. Comply with the additional requirements of Division 01.

END OF SECTION 08 80 00

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Metal framing of nonbearing vertical and horizontal surfaces and the following:
   1. Ceiling suspension system.
   2. Elevator shaft framing (if required).
   3. Flat strap and backing plate for support of wall mounted equipment and fixtures.

B. Related Requirements:
   1. Gypsum Board: Section 09 29 00.
   2. Tiling: Section 09 30 00.
   3. Acoustical Ceilings: Section 09 51 00; suspension for acoustical ceilings.
   4. Acoustical Treatment: Section 09 80 00; acoustic and vibration isolation devices.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Specifications and installation instructions for each type of steel stud required to show compliance with specified requirements.
   2. Manufactured top track for deflection relief, with UL approval data for each required condition.
   3. Manufactured drywall furring system, if used.
   4. ICC-ES Report of framing system for stud gage and spacing for all wall conditions.

B. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.

2. The following information shall be provided:
   a. Credit MR 4:
      1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
      2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
      3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
   b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Framing system shall conform to ICC-ES Report for stud gage and spacing for all wall conditions.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect metal studs and related materials from rusting and damage.

B. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. Wall Systems: Select steel studs in accordance with the manufacturer's standard load tables and the following design pressures and deflections:
   1. Typical Partitions: L/240 at 5 psf.
   2. Partitions to Receive Tiling Extending Over Wainscot Height: L/360 at 5 psf.
   3. At Stairs: L/240 at 10 psf.

B. Joisted ceiling deflection shall be designed to limit deflection to L/360.

C. Steel framing shall be isolated from building structure so as to prevent transfer of loading imposed by structural movement and at locations indicated below.
   1. Where edges of suspended ceilings abut building structure horizontally at ceiling perimeters or penetration of structural elements.
   2. Where partition framing abuts overhead structure. Provide slip-type joints as shown on the Drawings.

D. Sustainable Design:
   1. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of pre-consumer recycled content is not less than the following:
      a. Light Gage Metal Framing: Minimum 28 percent total recycled content, and minimum 16 percent post-consumer recycled content.
   2. Local/Regional Materials: Give preference to manufacturer's whose facilities are within a 500 mile radius of the project site. Also give preference to materials that are harvested, extracted, mined, quarried, etc. within a 500 mile radius of the project site.

2.2 MANUFACTURERS

A. Steel Framing and Furring Manufacturers: Subject to compliance with requirements, provide products by one of the following, or equal:
   1. Gold Bond Building Products Division, National Gypsum Co.
   2. United States Gypsum Co.

B. Steel Slip-Type Head Joints: Subject to compliance with requirements, provide products by one of the following, or equal:
   1. Brady Construction Innovations, Inc., Sliptrack Systems.
   2. ClarkDietrich Building Systems, SLP-TRK Slotted Track.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Framing Members, General: Comply with ASTM C754 for conditions indicated.
   1. Steel Studs and Runners: Comply with ASTM C645 requirements for metal, unless otherwise indicated.
      a. Minimum Base-Metal Thickness: 20 gage minimum.
      b. Flange Edges of Studs: Bent back 90 deg and doubled over to form 3/16-inch-wide minimum lip (return) and complying with the requirements indicated on Drawings for depth indicated.
      c. Protective Coating: ASTM A653/A653M, G60 (Z180) minimum, hot-dip galvanized zinc coating, unless otherwise indicated.

B. Ceiling Joists: 0.0538 inch (16-gage) steel C-shaped section with punched webs and 1-5/8-inch plain or perforated flanges to receive screws, ASTM A568 or A570 Grade 50, galvanized in accordance with A653/A653M, G60 (Z180) minimum, hot-dip galvanized zinc coating.

C. Elevator Shaft Steel Framing (If Required): C-H studs, 20 gage minimum or as indicated on Drawings.
   1. Steel Sheet Components: Comply with ASTM C645 requirements for metal, unless otherwise indicated.
   2. Protective Coating: ASTM A653/A653M, G60 (Z180) minimum, hot-dip galvanized zinc coating, unless otherwise indicated.

D. Slip-Type Head Joints: Where indicated, provide the following:
   1. Slotted Slip Track: ASTM C645 top runner with 2-1/2-inch- (63.5-mm-) deep flanges in thickness not less than indicated for studs; with 1-1/2-inch x 1/4-inch vertical slots.

E. Hat-Shaped, Rigid Furring Channels: ASTM C645.
   1. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm).
   2. Depth: 7/8 inch (22.2 mm).

F. Resilient Furring Channels: 2-5/8 inch, 25-gauge steel (minimum 0.0210 inch thickness), 1/2 inch deep asymmetric-shaped channel complying with ASTM C645, with a single slotted leg 1-1/2 inch screw flange; ClarkDietrich "RC Deluxe" (RCSD) or equal demonstrating equivalent metal thickness and laboratory acoustical performance.

G. Cold-Rolled Furring Channels: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges.
   1. Depth: 3/4 inch (19.1 mm).

H. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare-steel thickness of 0.0312 inch (0.79 mm).

I. Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
   1. Bracing Wire: Minimum 0.106-inch nominal diameter (12 gage).
   2. Tie Wire:
      a. Single Strand: Minimum 0.062-inch nominal diameter (16 gage).
      b. Double Strand: Minimum 0.048-inch nominal diameter (18 gage).

2.4 SUSPENSION SYSTEM COMPONENTS

A. Grid Suspension System for Gypsum Board Ceilings: As specified in Section 09 51 00 Acoustical Ceilings.

B. Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper. Minimum thickness:
   1. Hanging Wire: 0.162 inch nominal diameter (8 gage).
   2. Bracing Wire: 0.106 inch nominal diameter (12 gage).
   3. Tie Wire:
      a. Single Strand: 0.062 inch nominal diameter (16 gage).
      b. Double Strand: 0.048 inch nominal diameter (18 gage).

C. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch (1.37 mm) and minimum 1/2-inch- (12.7-mm-) wide flanges.
   1. Depth: 2 inches (51 mm).

D. Furring Channels (Furring Members): As specified.

2.5 ACCESSORIES

A. General: Provide auxiliary materials that comply with referenced installation standards.
   1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide the following:
   1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

C. Acoustical Flute Closure: Flexible cellular neoprene closure shaped to fit underside of deck flutes at steel deck/head of framing interface.

D. Acoustical and Vibration Isolation Devices: As specified in Section 09 80 00 Acoustical Treatment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements, installation tolerances, and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Comply with applicable requirements of ASTM C754, CBC Chapter 25, and with requirements in ASTM C840 that apply to framing installation.

B. Cutting:
   1. General: Cut framing components squarely or on angle as required to fit tightly with proper bearing against abutting members.
   2. Cutting Studs: If stud web is cut more than 50-percent, or stud flanges are cut, restore stud to original strength by wire-tying, or welding on steel reinforcement.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
   1. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with "Gypsum Construction Handbook" published by United States Gypsum Co.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

F. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement. Comply with details shown on Drawings. Provide slip- or cushioned-type joints as detailed to attain lateral support and avoid axial loading.

3.3 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacing's indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
      a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
   2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
      a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
   3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
   4. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

E. Headers: Install in accordance with ASTM C1007.

F. Grid Suspension Systems for Use with Gypsum Board: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install steel studs and furring in sizes and at spacing's indicated but not less than that required by the referenced steel framing installation standard to comply with maximum deflection and minimum loading requirements specified:
   1. Space studs as indicated on Drawings.
   2. Install studs so flanges within framing system point in same direction and so that leading edges or ends of each gypsum board can be attached to open (unsupported) edges of stud flanges first.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
   1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
   2. Door Openings: Frame door openings to comply with details indicated and with applicable published recommendations of gypsum board manufacturer. Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
      a. Install two studs at each jamb, unless otherwise indicated.
      b. Extend jamb studs through suspended ceilings and attach to underside of overhead structure, where indicated on Drawings.
   3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

D. Direct Furring: Attach to concrete with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches on center.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch in 10 feet in any direction from the plane formed by faces of adjacent framing.

F. Provide backing plates in wall to support wall-mounted items, including but not limited to wall-mounted casework, shelving, fixtures, equipment, and other locations as required by the various Sections of the Work.
   1. Attach backing plates, as specified, to carry loads required by CBC.
   2. Provide supplemental studs as required.

3.5 HORIZONTAL FRAMED SURFACES

A. Frame with specified joists, minimum 6-inch size, at 16 inches on center and to limit deflection as specified.

B. Provide runner channels to receive framing at ceiling and walls of same gage as studs. Secure with mechanical fasteners at 24 inches on center maximum. Secure studs to channels with screws.

END OF SECTION 09 22 16

SECTION 09 2900

GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Gypsum board, including finishing.

B. Related Requirements:
1. Miscellaneous Rough Carpentry: Section 06 10 53.
2. Gypsum Sheathing: Section 06 16 43.
3. Thermal Board and Blanket Insulation: Section 07 21 17.
4. Access Doors and Panels: Section 08 31 00.
5. Non-Structural Metal Framing: Section 09 22 16.
6. Wall Covering: Section 09 72 00.
7. Acoustical Insulation and Sealants: Section 09 82 00; acoustical sealants and sound control requirements.
8. Acoustical Wall and Ceiling Finishes: Section 09 83 10.
9. Painting and Coating: Section 09 90 00.

1.2 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C11 and GA-505 for definitions of terms for gypsum board construction not defined in this Section or in other referenced standards.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.

1.4 ACTION SUBMITTALS

A. Product Data: Manufacturer's product data for the following system materials suitable to show compliance with requirements.
1. Each type of board material.
2. Metal accessories, if other than listed products are to be provided.

B. Sustainable Design (LEED):
1. General:
a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.

b. LEED design submittals are in addition to other submittals.
c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with specified LEED requirements.

2. The following information shall be provided:
   a. Credit MR 4:
      1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
      2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
      3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
   b. Credit MR 5:
      1) Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.
      2) Include statement indicating costs for each product.
   c. Credit EQ 4.1:
      1) Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for field-applied adhesives and sealers used inside of the weatherproofing barrier of the building demonstrating compliance with SCAQMD Rule #1168.
      2) Manufacturer's product data for aerosol adhesives used inside of the weatherproofing barrier of the building, including printed statement of VOC content that demonstrates compliance with the limits defined in Green Seal Standard GS-36.

1.5 INFORMATIONAL SUBMITTALS

A. Statement of installer qualifications, if requested by County's Representative.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Fire-Resistance Ratings:
      a. Comply with fire-resistance ratings as indicated and required by governing authorities and codes.
      b. Provide materials, accessories, and application procedures that have been listed by a nationally recognized testing agency or tested according to ASTM E119 for type of construction shown.
   2. Comply with the CBC, Chapter 25.

B. Industry Standards: Work shall comply with the applicable requirements of GA publication GA-216 and GA-214.

C. Installer Qualifications: Company specializing in work similar to that required on this Project, with documented experience.

D. Notify County's Representative prior to covering or enclosing framing, ducts, and pipes in sound-rated construction in order to allow for on-site review and correction as required.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials in dry location, fully protected from weather, direct exposure to sunlight, and damage from other construction activity.

B. Stack gypsum board products flat and level, properly supported in such a manner as to prevent sagging or damage to ends and edges.

C. Store metal accessories so as to prevent bending, sagging, distortion, or other mechanical damage.

D. Do not store or stack gypsum board on floors of new work with an equivalent loading in excess of 40 pounds per square foot.

E. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

1.8 FIELD CONDITIONS

A. Ambient Conditions: Maintain temperature in installation area in accordance with GA-216 requirements. Provide supplemental heat as required to maintain minimum temperatures specified in GA-216.

B. Ventilation:
   1. Provide controlled ventilation during joint finishing in order to eliminate excessive moisture.
   2. Avoid drafts during hot, dry weather in order to prevent excessively fast drying of joint compound.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

B. Sustainable Design (LEED):
   1. Gypsum panels shall contain recycled content to be the greatest amount available but not less than 40 percent post-industrial content.

2. All interior products shall meet LEED Program VOC requirements including primers, adhesives, sealers, sealants, and backer rods.

2.2 MATERIALS - GENERAL

A. Products of specific manufacturers, when listed, are for quality and performance identification only. The listing is not intended to limit selection of similar products from other manufacturers.

B. Provide products manufactured by or recommended by manufacturer of gypsum board in order to maintain single-source responsibility.

C. Provide materials in accordance with ASTM C840.

D. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Fire Rated Gypsum Board: ASTM C1396, Type X, unless more stringent type required by code; USG "Sheetrock Firecode Core," or equal.
   1. Thickness: 5/8 inch, unless otherwise noted.
   2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

B. Fire-Rated Moisture- and Mold-Resistant Board: ASTM C1396, Type X, unless more stringent required by code; USG "Sheetrock Mold Tough Firecode Core," or equal.
   1. Thickness: 5/8 inch, unless otherwise noted.
   2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
   3. Mold Resistance: 10 on scale of 10 in when tested accordance with ASTM D3273.
   4. Moisture Resistance: The average water absorption for panels shall not exceed 5 percent by weight after two-hour immersion when tested in accordance with ASTM C473.

C. Acoustically Enhanced Gypsum Board: ASTM C1396, Type X, multilayer product constructed of two layers of gypsum boards, sandwiching a viscoelastic sound-absorbing polymer core, encased in mold resistant face paper; Gold Bond "SoundBreak XP" by National Gypsum Company, equal by Pyrok, or equal.
   1. Thickness: 5/8 inch, unless otherwise noted.
   2. Edges: Tapered.
   3. Mold Resistance: 10 on scale of 10 in when tested accordance with ASTM D3273.

2.4 ACCESSORIES

A. Adhesives:
   1. Laminating Adhesive: As recommended by gypsum board manufacturer for laminating gypsum board together in fire-rated construction.
   2. Application to Wood Framing: Certified in accordance with ASTM C557.
   3. Adhesives shall comply with required VOC regulations.

B. Fasteners:
   1. Screws: Phillips head with bugle shape, conforming to ASTM C1002.
      a. Use Type S for attachment to resilient channels.
      b. Use Type W for attachment to wood backing.
   2. Sizes of fasteners shall be as required by code and as recommended by wallboard manufacturer.

C. Concealed Metal Reinforcements and Casing: Electrogalvanized, conforming to ASTM C1047.
   1. Exterior Corner: United States Gypsum (USG) "Dur-A-Bead," Casings Western No. 220, or equal.
   2. Intersection of Gypsum Board with Dissimilar Material: USG No. 200-B "L" shaped trim and 200-A "J" shaped trim, Casings Western, or equal.
   3. Control Joint: USG No. 093 or equal.

D. Resilient Furring Channels: As specified in Section 09 22 16 Non-Structural Metal Framing.

E. Joint-Treatment Materials:
   1. Manufacturer: Same as gypsum board.
   2. Comply with ASTM C475 and with manufacturer's recommendations for specific project conditions.
   3. Joint Tape: Manufacturer's standard paper type. If recommended by manufacturer, provide open-weave fiberglass tape for joint treatment of gypsum backing board.
   4. Joint Compound: Vinyl-based, ready-mixed type for interior use and as follows:
      a. Taping Compound: Specifically formulated for embedding tape and accessories and for prefilling.
      b. Topping Compound: Specifically formulated for finishing drywall over taping compound.
      c. At joints and fasteners in moisture-and-mold-resistant gypsum backing board intended for tile surfacing, provide compound specifically recommended or permitted by manufacturer of backing board.

F. Access Doors: As specified in Section 08 31 00 Access Doors and Panels.

G. Sound-Attenuation Blankets and Acoustical Sealants: As specified in Section 09 82 00 Acoustical Insulation and Sealants.

H. Shaft-Liner Board (If Required):
   1. ASTM C442.
   2. Thickness: 1 inch.
   3. Edges: Square.

I. Miscellaneous Items: Furnish components not specified but shown on the Drawings and other items required to complete the installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check framing for accurate spacing and alignment.

B. Verify that spacing of installed framing does not exceed maximum allowable for thickness of gypsum board to be used.

C. Do not proceed with installation of gypsum board until deficiencies are corrected and surfaces to receive gypsum board are acceptable.

D. Repair protrusions of framing, twisted framing members, or unaligned members before starting installation of gypsum board.

3.2 APPLICATION OF RESILIENT METAL FURRING

A. Attach metal furring as specified in Section 09 22 16 Non-Structural Metal Framing.

3.3 APPLICATION OF GYPSUM BOARD

A. General: Comply with ASTM C840, GA-216, and CBC. Where UL designs are indicated on the Drawings for fire-rated partitions, comply with UL requirements, except where exceeded by other requirements.
   1. Wherever possible, install gypsum board in such a manner as to minimize butt end joints.
   2. Apply ceiling boards prior to installation of wall boards. Arrange so as to minimize butt end joints near center of ceiling area.
   3. Install wall boards in such a manner as will minimize butt end joints in center of wall area. Stagger vertical joints on opposite sides of walls. Stagger horizontal joints where required by governing code.
   4. Butt all joints loosely, with maximum of 1/16 inch between boards.
   5. Place wrapped edges adjacent to one another. Do not place cut edges or butt ends adjacent to wrapped edges.
   6. Support all edges and ends of each board on framing or by solid substrate, except that long edges at right angles to framing members in non-fire-rated construction may be left unsupported, unless required by governing code.

B. Single-Layer Application:
   1. Install gypsum board by means of screw attachment.
   2. On walls and partitions, plan installation so that leading edge or end of gypsum board is attached to open end of stud flange first.
   3. Mark location of joists and studs. Do not locate screws attaching gypsum board to channels within 2 inches of joists or studs.

C. Double-Layer Application (If Required):
   1. Apply base layer vertically, offsetting vertical joints at least one stud space between layers.
   2. Install base layer by means of screw attachment.
   3. Provide fire taping only.
   4. Precut and fit face layer by laminating to base layer with adhesive.
   5. Provide temporary support for face layer, by fasteners or shoring, until adhesive is dry.
   6. At Contractor's option, provide permanent support by attaching face layer to base layer with screws in accordance with manufacturer's instructions.

D. Metal Trim:
   1. Apply trim at all exterior corners and at interior corners where gypsum board intersects metal or other dissimilar material.
   2. Install in longest lengths practicable.
   3. Run trim straight and square with all planes.
   4. Control Joints:
      a. Provide control joints in accordance with ASTM C840 recommendations, where and where otherwise shown and specified.
         1) Walls: Provide where areas are 30 feet or more in either direction.
         2) Ceilings: Provide to divide into areas not exceeding 2,500 square feet and at not more than 50 feet on center.
      b. Where not shown, locate as instructed by County’s Representative.
      c. Break gypsum board back of joint 1/2 inch.
      d. Ceilings: Back with continuous furring channels each side, spaced 2-1/4 inches apart, centered on break.
      e. Partitions: Back with double studs.
   5. Edges:
      a. Apply applicable shape of metal edge trim at exposed edges of wallboard and where otherwise shown.
      b. Gypsum Board Abutting Other Materials: Install edge trim with 1/8-inch clearance to allow for sealant.
      c. Apply neoprene tape where shown to assure sealed joints at abutting surfaces.
         1) Install in longest lengths practicable.
         2) Adhere to edge trim prior to installation of trim.
         3) Coordinate application of tape with installation of metal framing as specified in Section 09 22 16 Non-Structural Metal Framing.
   6. External Corners: Apply metal corner beads at external corners in single lengths, unless details clearly indicate its omission at specific locations.

E. Remove and replace sheets damaged in handling or installation.

F. For conditions not specified or shown on the Drawings, follow procedures recommended by the gypsum board manufacturer.

G. Leave gypsum board in a clean condition, ready for taping and painting.

3.4 SOUND-RATED CONSTRUCTION

A. Comply with requirements for sealing penetrations at sound-rated construction as specified in Section 09 82 00 Acoustical Insulation and Sealants.

3.5 FIELD QUALITY CONTROL

A. Construction Tolerances:
   1. Gypsum board surfaces to be painted shall have no measurable variation in any 2-foot direction and a maximum variation of 1/8 inch in 10 feet 0 inches when a straightedge is laid on the surface in any direction.
   2. See Section 09 23 13 Acoustical Gypsum Plastering for tolerances required for surfaces to receive gypsum plaster.
   3. See Section 09 30 00 Tiling for tolerances required for surfaces to receive tile.
   4. Shim work as required to comply with specified tolerances.
   5. Do not exceed 1/16-inch offset between planes of abutting sheets at edges or ends.

3.6 TAPING AND FINISHING

A. Gypsum board partitions shall be appropriately prepared for finish indicated on the Drawings.

B. General Requirements:
   1. Apply finishing compounds in accordance with manufacturer's directions. Do not apply tape and joint compound over joints containing acoustical sealant until the sealant has completely cured.
   2. Center tape over joint, and embed in uniform layer of joint compound of sufficient width and depth to provide firm and complete bond.
      a. Apply skim coat while embedding tape.
      b. Apply second coat after skim coat has hardened and been sanded.
      c. Apply finish coat, and sand smooth, flush with adjacent surfaces.
      d. Use appropriate water-resistant compound at moisture and mold resistant gypsum board filling all fastener heads, penetrations, and joints.
   3. Treat angles with reinforcing tape, folded to conform to adjacent surfaces and with straight, true angles.
   4. Provide minimum 24 hours' drying time between applications of compounds.
   5. Conceal flanges of metal reinforcement with minimum two coats compound. Compound shall extend 8 to 10 inches each side of metal nosing.

C. Level of Finishes: In accordance with GA-214.
   1. At Locations Indicated to Receive "Fire-Taping" and at Unexposed Gypsum Board Applications: Level 1.
   2. At Locations to Receive Flat Paint and Indicated to Receive Wall Coverings: Level 4.
   3. Surfaces to Receive Paint Finish with Gloss Level Greater than Flat Paint and Walls More Than One Story High (Except Utilitarian Areas such as Janitor Rooms, Storerooms, and Mechanical Spaces): Level 5.
   4. Surfaces to Receive Ceramic Tile: Level 3.
   5. Surfaces to Receive Flat or Eggshell Gloss Levels: Level 4.
   6. Surfaces to Receive Acoustical Finishes: Level 4.
   7. Surfaces to Receive Semi-Gloss or Gloss Levels, and Walls More Than One Story High (Except Utilitarian Areas such as Storerooms): Level 5.
   8. Projection Surfaces: Level 5.
   9. Surfaces to Receive Wall Covering: Level 5.

3.7 PROTECTION OF FINISHED WORK

A. Provide proper procedures for protection of completed gypsum board from damage or deterioration until final acceptance of the Project.

END OF SECTION 09 29 00

SECTION 09 30 00

TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Interior ceramic and stone floor and wall tile.
      a. Includes cleaning and re-installation of salvaged stone flooring.
   2. Exterior stone pavers at Main Entrance.
   3. Waterproofing/crack isolation membrane under all floor tile and pavers.
   4. Grouting of tile.
   5. Tile sealers.

B. Related Requirements:
   1. Portland Cement Underlayment: Section 03 54 15.
   2. Decorative Metal Stairs: Section 05 71 00; precast terrazzo treads and risers.
   3. Joint Sealants: Section 07 92 00.
   4. Gypsum Board: Section 09 29 00; water-resistant gypsum backing board.
   5. Toilet Accessories: Section 10 28 13.
   6. Solid Surfacing Countertops: Section 12 36 61.
   7. Entrance Floor Mats and Frames: Section 12 48 13.
   8. Product and Finish Schedule: Sheet A7.0.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
   3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

B. Coordinate with installation of toilet accessories, entrance floor mats and frames, plumbing fixtures, and other items to be installed in or adjacent to tile.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Submit for the following:
   1. Custom tile patterns and layouts.
   2. Widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces. Locate each joint and crack in tile substrates from field measurements, and coordinate with tile joint locations in consultation with the County's Representative.

B. Product Data:
   1. Manufacturer's product literature for all manufactured products.
   2. Installation instructions for trim, and accessories.
   3. Installation instructions for stone tile.
   4. Installation instructions for tile 16 inches or greater in any dimension.
   5. Installation instructions for manufactured setting and grouting products.

C. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 4:
         1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
         2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
         3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
      b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.
      c. Credit EQ 4.1: Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for field-applied adhesives and sealers used inside of the weatherproofing barrier of the building demonstrating compliance with SCAQMD Rule #1168.

D. Samples for Verification Purposes:
   1. Each color, size, and type of tile and grout specified and selected, mounted on plywood or hardboard backing, grouted, and not less than 12 inches square. For products with color and texture variation, submit sets showing full range of variations expected.
   2. Samples of each type of edge trim and accessory, 6 inches long, in each color.
   3. Include samples showing proposed cleaning methods for salvaged stone tile.

1.4 INFORMATIONAL SUBMITTALS

A. Quality Control:
   1. Statement of installer qualifications. Include list of completed projects with project names, addresses, and names of architects and owners.

2. Test Reports:
   a. Certified laboratory or field tests for slip resistance as specified.
   b. Water test for waterproofing membrane.
3. Master grade certificates for each shipment, type, and composition of tile, signed by the manufacturer and installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance materials as specified.

B. Extended warranty for waterproofing, setting, and grouting products.

1.6 QUALITY ASSURANCE

A. Slip Resistance: Floor tile shall provide a value equal to or greater than 0.42 when tested in accordance under dry conditions with DCOF AcuTest procedure contained in ANSI A137.1:2012, Section 9.6, and under wet conditions with DCOF AcuTest procedure of ANSI B101.3. Laboratory tests shall be made on a minimum of three tiles of each material and finish proposed for use.

B. Installer Qualifications: Successful completion of tile installations similar in material, design, and extent to that required for this Project.

C. Except where more stringent requirements are specified, conform to applicable ANSI Standards as follows:
   1. Ceramic Tile: ANSI A137.1 "Standard Grade."
   2. Tile Installation Materials: Comply with ANSI standard referenced with products and materials specified for setting and grouting.

D. Within any given tile setting system, use the products of a single manufacturer to ensure compatibility and single source responsibility.

E. Mockups:
   1. Install tile in designated areas for verification by County's Representative of slip-resistance, workmanship, detailing, color, general appearance, and interface with adjacent construction, including adjacent flooring.
   2. Mockups are required for all stone tile and pavers, for other tile 16 inches or greater in any dimension, and elsewhere as requested by County's Representative.
   3. Coordinate with other Sections as required for review and approval by County's Representative.
   4. Mockups shall consist of typical installation in specified finish and color and shall be sufficiently large and complete to demonstrate installation and aesthetic effect of completed installation. Include perimeter, termination, and corner conditions.
   5. Where appropriate, approved mockups may remain as part of the Work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Ceramic Tile cartons shall be grade sealed by manufacturer in accordance with ANSI A137.1. Grade seals shall be unbroken.

B. Manufactured setting and grouting materials shall contain hallmarks certifying compliance with reference standards.

C. Deliver dry-set mortar in sealed, moistureproof containers.

D. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

1.8 FIELD CONDITIONS

A. Ambient Conditions: Comply with minimum temperature recommendations of manufacturers for bonding and grouting materials. If manufacturer has no recommendations, maintain temperature at not less than 50 degrees F during tile installation and for at least 7 days after completion of installation.

1.9 MAINTENANCE

A. Extra Material: 5 percent of each color, size, and type of tile installed for County's use in future.
   1. Package in sealed, clean, marked cartons of the tile manufacturer.
   2. Deliver to County as directed.

1.10 WARRANTY

A. Manufacturer Warranties:
   1. Manufacturer of setting and grouting materials shall provide a written 5-year warranty for the installation, covering replacement of materials and labor.
   2. Manufacturer of waterproofing materials shall provide a written 10-year warranty against defects in materials and workmanship including water leakage.

PART 2 - PRODUCTS

2.1 TILE PRODUCTS

A. Ceramic and Stone Tile: Products, Manufacturers, Materials, Sizes, Colors, Finishes, Thicknesses, and Glazes: As listed in Product and Finish Schedule on Sheet A7.0.

B. Factory Blending: For tile exhibiting color variations within the ranges selected during sample submittals, blend tile in factory, and package accordingly so that tile units taken from one package will show the same range of colors as those taken from other packages and will match accepted samples.

C. Glazed Wall Tile: Standard Grade, conforming to Section 6.1 of ANSI A137.1.

D. Ceramic Mosaic Tile: Unglazed porcelain, conforming to Section 5.1 of ANSI A137.1.

E. Porcelain Tile: Unglazed porcelain.

F. Trim Shapes and Bases:
   1. Provide cove base, bullnose, returns, trimmers, and other shapes, both standard and special, to finish installation and as indicated on the Drawings.
   2. Color and finish of trim shapes shall match adjacent tile. Base shall match wall tile.

2.2 WATERPROOFING AND CRACK ISOLATION MATERIALS

A. Fabric Reinforced Liquid-Applied Waterproofing and Crack Isolation Membrane: "Laticrete 9325" by Laticrete, "9240" by Custom Building Products, "Mapelastic 400" by Mapei, or equal meeting ANSI A118.12 for crack isolation membranes and ANSI 118.10 for waterproofing membranes and the following minimum requirements:
   1. IAPMO approved as a shower pan liner.
   2. Service Rating (TCNA/ASTM C627): Extra Heavy
   3. Elongation at break (ASTM D751): 20-30 percent,
   4. System Crack Resistance (ANSI A118.12): Pass (High).
   5. Breaking Strength (ANSI A118.10): 2400 psi.
   6. Shear Strength (ANSI A118.10): 280 psi.
   7. Total VOC Content: Equal to or less than 0.02 lb/gal (2.39 g/liter).
   8. GreenGuard Gold Certified.

B. Moisture-Resistant Membrane at Shower Walls: Either:
   1. Building Felt: ASTM D226, No. 15 roofing felt.
   2. Polyethylene Sheet: ASTM C171, 4 mil.

2.3 UNDERLAYMENT MATERIALS

A. Underlayment: As specified in Section 03 54 15 Portland Cement Underlayment.

B. Latex Modified Portland-Cement Mortar Bed for Shower: ANSI A118.1; Portland-cement-based filler with synthetic latex additive; "226 Thick Bed Mortar Mix" with "3701 Mortar Admix" by Laticrete, "209 Floor Mud" with "3701 Mortar Admix" by Laticrete, or equal.
   1. Reinforcing Mesh for Mortar Bed: ASTM A185, 2-inch-x-2-inch-x-16/16-gage welded-wire fabric.
   2. Bond Coats:
      a. Tile to Mortar Bed: Portland cement paste on a plastic bed or latex Portland cement mortar on a cured bed, unless otherwise specified.

b. Mortar Bed to Concrete Substrate: Portland cement slurry coat. Verify concrete surface has texture equivalent to a fine broom finish and is free of curing compounds, oils, or other emollients that would inhibit bond.

2.4 SETTING MATERIALS

A. Latex Portland Cement Mortar: ANSI A118.4; "PremiumPlus Thin-Set Mortar" with "Acrylic Mortar Admix" by Custom Building Products, “254 Platinum" by Laticrete, "Kerabond Premium Floor and Wall Dryset Mortar" by Mapei, or equal.

B. Medium-Bed Latex Portland Cement Mortar: ANSI A118.4; "Ultra/Flor Mortar" mixed with "Keraply" by Mapei, "220 Marble & Granite” medium bed mortar by Laticrete, or equal.
   1. Use medium-bed mortar for tile 16 inches or greater in any dimension.

C. Stone Adhesive: High-strength, specifically designed to set stone without staining; "Marble and Granite Mortar Mix" by Custom Building Products, "Planicrete W" by Mapei, "220 Marble & Granite” medium bed mortar by Laticrete, or equal. If marble or stone is susceptible to warping, adhesive shall be specified 100 percent solids epoxy type; verify with stone supplier.

D. Epoxy Mortar (If Recommended by Tile Supplier): ANSI A118.3; 100 percent solids; "Latapoxy 300" Adhesive” by Laticrete, "Kerapoxy" by Mapei, Custom Building Products, or equal.

E. Provide primers, levelers, and other products recommended by manufacturers of setting materials or required for a complete installation.

2.5 GROUTING MATERIALS

A. Polymer-Modified Sanded Cementitious Grout: ANSI 118.6; factory-prepared sanded grout for joint widths of 1/8-inch or more; "Keracolor S" by Mapei, “1500” with “1776 Grout Admix” by Laticrete, or equal.

B. Polymer-Modified Unsanded Cementitious Grout: ANSI 118.6; factory-prepared unsanded grout for joint widths of less than 1/8-inch; "Keracolor U" by Mapei, “1600” with “1776 Grout Admix” by Laticrete, or equal.

C. Epoxy Grout: ANSI A118.3; "Kerapoxy IEG" by Mapei, "SpectraLOCK PRO" by Laticrete, or equal.

D. Grout Colors: As selected by the County’s Representative.

2.6 OTHER MATERIALS

A. Sealant: As provided by grout manufacturer.
   1. Color: To match color of grout in adjacent joints.

2. Provide sanded or nonsanded type as required to match type of grout.

B. Glass Mat Gypsum Backer Board for Shower: Glass-mat-faced, silicone-impregnated type Type X, 5/8 inch thick meeting ASTM C1178; Georgia-Pacific "Dens-Shield" Tile Backer, or equal.

C. Water: Clean and potable.

D. Cleaners and Sealers: HMK Stone Care Products, or equal.
   1. General:
      a. Sealers are not required for porcelain tile, ceramic mosaic tile, or glazed ceramic tile if installed with epoxy grout.
      b. Sealers are required for all stone tile and pavers.
      c. Tile cleaners shall be specifically acceptable to tile manufacturer and grout manufacturer for application intended and as recommended by National Tile Promotion Federation (NTPF) for Ceramic Tile Institute (CTI).
   2. Glazed Tile:
      a. Cleaner: "R55 Intensive Cleaner/Grout Film Remover."
   3. Unglazed Ceramic Tile:
      a. Cleaner: "R55 Intensive Cleaner/Grout Film Remover."
      b. Sealer: Two coats "S34 Silicone Impregnator."
   4. Porcelain Tile:
      a. Cleaner: "R61 Porcelain Tile Cleaner."
      b. Sealer: One coat "S45 Water Base Impregnator."
   5. Stone Tile and Stone Pavers: As recommended by stone supplier.

E. Stainless Steel Cove Base: DILEX-EHK by Schlüter Systems, or equal.

F. Metal Edge Protection, Transition Strips, and Dividers: Extruded anodized aluminum.
   1. Manufacturers: Ceramic Tool Company, Inc., Schlüter Systems, or equal.
   2. Height and Profile: As required by tile installation.

G. Prefabricated Movement Joints (If Required): Extruded anodized aluminum with flexible, traffic-bearing, thermoplastic movement zone.
   1. Manufacturers: Ceramic Tool Company Inc., Schlüter Systems, or equal.
   2. Height, Width, and Profile: As required by tile installation.

H. Protective Paper: Nonstaining laminated and reinforced Kraft paper with bituminous or latex binder.

2.7 MIXING MORTAR AND GROUT

A. Mix mortar and grout so as to comply with requirements of referenced standards and manufacturer's instructions in order to produce mortar and grout of uniform quality, with optimum performance characteristics for application indicated.

B. Prepare and proportion premixed setting beds and grout materials in accordance with manufacturer's recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive ceramic tile, setting beds, or accessories for defects or conditions adversely affecting quality and execution of tile installation.
   1. Surfaces shall be firm, dry, clean, and free of oily or waxy films.
   2. Grounds, anchors, plugs, hangers, bucks, and electrical and mechanical work in or behind tile shall be installed prior to proceeding with tile work.

B. Allowable Tolerances of Surfaces to Receive Tile:
   1. Maximum Variation in Vertical Surfaces: 1/8 inch in 8 feet.
   2. Maximum Variation in Horizontal Surfaces: 1/8 inch in 10 feet.

3.2 PREPARATION

A. Protect adjoining work surfaces before tile work begins. Close spaces in which tile is being set to traffic and other work. Keep closed until firmly set.

B. Install underlayment as required for level or sloping surface as shown.

3.3 INSTALLATION OF WATERPROOFING/CRACK ISOLATION MEMBRANE

A. Install waterproofing membrane at all areas to receive floor tile in accordance with ANSI A108.13 and manufacturer's instructions and as required for specified warranty; summarized as follows.
   1. Pretreat penetrations, coves, corners, drains, perimeter sealant joints, and other similar conditions.
   2. Apply a liberal coat liquid membrane with brush or roller over substrate including pre-treated areas.
   3. Embed fabric into membrane, smoothing out any wrinkles, and pressing into membrane with a brush or roller until liquid membrane bleeds through fabric. Lap seams 2 inches.
   4. Flash membrane up over pretreated coves and corner areas to provide two layers of membrane at these locations.
   5. Apply another liberal coat of liquid membrane to fully saturate fabric.
   6. When dry to the touch, complete installation with application of an additional layer of liquid membrane to seal entire surface.

3.4 TILE INSTALLATION - GENERAL

A. Except as otherwise specified, work shall conform to the recommendations and listed installation methods included in the “Handbook for Ceramic, Glass, and Stone Tile Installation” published by the Tile Council of North America, Inc.

B. Laying out Tile Work:
   1. Lay out tile work so that, insofar as possible, no tile less than half full size occurs.
   2. Lay floor areas out from center lines so that all major adjustments are made at walls and perimeter of tiled areas.
   3. Lay out wall tiles so that fields and patterns center exactly on individual wall areas.
      a. Exterior angles shall be bullnose.
      b. Cap shall be bullnose, same size as wall tile.
   4. Align joints vertically and horizontally.
   5. When floor and wall tiles are the same size, align joints. If it is not possible, based on configuration of walls and spaces, to comply with requirement that no tile less than half full size occurs while, at the same time, aligning wall and floor joints, confer with County's Representative to arrive at an acceptable solution prior to installing the tile.

C. Cutting of Tiles:
   1. Cut and drill without marring tile.
   2. Rub cuts smooth with a fine abrasive stone.
   3. Set no cut edge against any fixture, cabinet, or other tile without a joint at least 1/16 inch wide.
   4. Whenever possible, turn cut to inside corner.
   5. Fit tile around electric outlets, plumbing pipes, fixtures, and fittings close enough to permit standard plates and collars to overlap tile.

D. Sound tile after setting. Remove and replace hollow-sounding units.

E. Allow tile to set at least 48 hours prior to grouting.

F. Grout tile to comply with requirements of ANSI A108.10.

G. Joint Sealants:
   1. Install sealant in perimeter, control and expansion joints, and around floor drains and pipes.
   2. Comply with installation requirements for sealants specified in Section 07 92 00, "Joint Sealants."
   3. After curing, remove spacers, and dry and clean all joints requiring sealant.
   4. Prefabricated movement joints may be used in lieu of sealant joints where acceptable to County's Representative.

3.5 INSTALLATION METHODS

A. Prepare surface, fit, set or bond, grout, and clean in accordance with applicable requirements of ANSI standards for setting method specified.

B. Wall Tile at Dry Areas: TCNA Method W243.
   1. Thin-set tile over water-resistant gypsum board specified in Section 09 29 00, "Gypsum Board," with latex Portland cement mortar in accordance with ANSI A108.5.
   2. Install latex Portland cement grout or epoxy grout as specified.

C. Wall Tile over Concrete or CMU: TCNA Method W202.
   1. Thin-set wall tile over concrete or CMU, using latex Portland cement mortar in accordance with ANSI A108.5.
   2. Install latex Portland cement grout or epoxy grout as specified.

D. Wall Tile at Shower: TCNA Method B415.
   1. Install water-resistant membrane over framing. Extend out minimum 3 feet beyond face of showers.
   2. Install glass mat gypsum backer board over framing in accordance with manufacturer's instructions.
      a. Horizontal and vertical joints shall fit closely.
      b. Embed 2-inch glass-fiber-mesh tape in skim coat of mortar used to set tile at joints.
   3. Thin-set wall tile over backer board, using latex Portland cement mortar in accordance with ANSI A108.5.
   4. Install epoxy grout as specified.

E. Floor Tile and Pavers, General: TCNA Method F122.
   1. Install waterproofing/crack isolation membrane over concrete in accordance with ANSI A108.13 and manufacturer's directions, turning up wall minimum 6 inches.
   2. For tile less than 16 inches in any dimension, thin-set tiles over waterproof membrane in bond coat of latex Portland cement mortar in accordance with ANSI A108.5.
   3. For tile 16 inches or greater in any dimension, use medium-bed Portland cement mortar or epoxy mortar as recommended by tile manufacturer. Follow tile manufacturer’s recommendations for additional installation procedures.
   4. For stone flooring and pavers, use medium bed mortar, epoxy mortar, or stone adhesive as recommended by stone supplier. Stone tiles and pavers shall be back buttered to ensure full contact of setting mortar to tile and substrate.
   5. Exercise care to avoid damage to waterproofing/crack isolation membrane.
   6. Install sanded epoxy grout as specified.

F. Floor Tile at Shower: TCNA Method F112 (full mortar bed).
   1. Install waterproofing/crack isolation membrane over concrete in accordance with ANSI A108.13 and manufacturer's directions, turning up wall minimum 6 inches.
   2. Form 1/4-inch-per-foot slope to drain with Portland cement mortar.
   3. Install tile in full reinforced mortar bed in accordance with applicable provisions of ANSI A108.1C. Surround drain with crushed pieces of tile or stones so as to keep weep holes in drain clear of mortar.
   4. Exercise care to avoid damage to waterproofing/crack isolation membrane.

5. Install sanded epoxy grout as specified.

G. Control, Contraction, Construction, and Isolation Joints:
   1. Locate joints, and install in accordance with TCNA Method EJ171.
   2. Provide where tile abuts restraining surfaces in such locations as perimeter walls, dissimilar floors, curbs, columns, pipes, and ceilings and where changes occur in backing materials.

3.6 ADJUSTMENT AND CLEANING

A. Remove cracked, stained, discolored, broken, or damaged tile. Replace with new tile.

B. Clean tile surfaces as thoroughly as possible on completion of grouting.

C. Remove grout haze, observing grout manufacturers' recommendations as to use of acid and chemical cleaners.

D. Rinse tile work thoroughly with clean water before and after using chemical cleaners.

E. Use no acids or abrasive soaps on tile, except as approved by tile manufacturer.

3.7 CURING, PROTECTION AND FINISHING

A. Floor Tile:
   1. Apply protective paper over floor tile as soon as pointing and grouting and cleaning are completed.
      a. Lap sheets at least 4 inches, and seal laps against escape of moisture.
      b. Leave paper in place until job is ready for final cleaning.
   2. Where sealer is required:
      a. After cleaning, apply specified sealer in accordance with manufacturer's application instructions.
      b. Re-cover tile with paper to protect from construction dirt.
   3. Just before final acceptance of tile work, remove paper and re-clean surfaces with neutral cleaner as needed.

B. Wall Tile:
   1. Apply a protective coat of neutral cleaner solution, one part cleaner to one part water, to all clean, completed tile walls after grout has cured.
   2. Just before final acceptance of tile work, rinse protective coat of neutral cleaner from all tile surfaces.

END OF SECTION 09 30 00

SECTION 09 51 00

ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. New acoustical ceiling panels in existing suspension systems.
2. New acoustical ceiling panels and "clouds" in new suspension systems.

B. Related Requirements:
1. Acoustical Treatment: Section 09 80 00; acoustic and vibration isolation devices.
2. Acoustical Wall and Ceiling Finishes: Section 09 83 10.
3. Division 23: HVAC; air diffusers.
4. Division 26: Electrical; lighting fixtures.
5. Product and Finish Schedule: Sheet A7.0.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

B. Coordination:
1. Develop and coordinate locations of work supported by or penetrating through ceiling with the other Sections involved prior to making shop drawing submittal. In particular, note partitions that are to be installed prior to ceiling installation.
2. Coordinate layout and installation of acoustical ceiling panels and suspension system with work supported by or penetrating through ceilings.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Include the following:
1. Layout of suspension system and location of hangers, seismic braces, edge moldings, and trapezes.
2. Trapeze details.
3. Splicing method for main and cross runners.
4. Support of ceiling fixtures and air diffusers, and support of adjacent acoustical panels.
5. Details at terminations, edge moldings, and changes in ceiling level.

6. Locations and dimensions of access doors, light fixtures, supply and exhaust grilles and diffusers, sprinkler heads, speakers, detection devices, and all other items to be installed in suspended acoustical ceilings.
7. Seismic control details.

B. Product Data: Manufacturer's catalog cuts for new and replacement suspension system components and acoustical panels.
   1. Data sheets shall be marked to identify specific products proposed for use.
   2. Include ICC-ES Report for seismic clips.

C. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   3. The following information shall be provided:
      a. Credit MR 4:
         1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
         2) Statement or vendor’s invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
         3) Cut sheets or manufacturer’s technical data sheet indicating levels of recycled content for each material having recycled content.
      b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

D. Delegated-Design Services: Seismic and structural design engineering data including diagrams, calculations, and supporting data when required by code to indicate conformance to specified design requirements including adequacy of suspension system to withstand specified seismic and structural loading. Engineering data shall be by the engineer in responsible charge retained by the Contractor. Engineer shall be a California licensed civil or structural engineer.

E. Samples:
   1. 6-inch x 6-inch sample of each type of acoustical panel required.
   2. 8-inch-long sample of each type of exposed suspension member and trim, showing profile and finish.

1.4 CLOSEOUT SUBMITTALS

A. Extra materials as specified.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Minimum of three installations of extent comparable to Project.

B. Mockups: First installed area or example of each type of acoustical ceiling shall serve as a mockup for review by County's Representative of workmanship, visual effect, and interface with adjacent construction. Include accessories, grilles, and light fixtures.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver with manufacturers' labels indicating brand name, pattern, size, thickness.

B. Store cartons open at each end to stabilize moisture content and temperature.

C. Do not begin installation until sufficient materials to complete a room are received.

D. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

1.7 FIELD CONDITIONS

A. Ambient Conditions: Do not install acoustical panel ceilings until wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Do not install acoustical ceilings until work above ceilings is completed, including testing and approval of mechanical work.

1.8 EXTRA MATERIAL

A. Acoustical Units: Furnish extra material 40 square feet in full-size acoustical panels for each type of acoustical panel installed.

B. Suspension System Components: Not required.

C. Deliver extra material to County in sealed containers of the material manufacturer.

1.9 WARRANTY

A. Provide the following extended product warranties by manufacturer:
   1. Acoustical Panels: 10 years.
   2. Suspension Grid and Accessories: 10 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Basis of Design: Armstrong; as listed for individual products in Product and Finish Schedule on Sheet A7.0.

B. Products of other manufacturers will be considered for substitution, provided that materials match designated products in color, texture, appearance, and performance to satisfaction of County's Representative.

2.2 PERFORMANCE AND DESIGN CRITERIA

A. Seismic Requirements:
   1. Ceilings shall comply with CBC requirements for seismic bracing of ceiling suspension system.
   2. Ceiling Compression Struts:
      a. Provide struts as shown on Drawings and as required by code, placed maximum 12 feet on center in both directions and within 6 feet of each wall.
      b. Bracing system shall be adequate to support nonbearing ceiling-height partitions spaced at 10 feet on center.

B. Fire Performance Characteristics:
   1. Surface Burning Characteristics: Provide products complying with ASTM E 1264 for Class A products and meeting the following when tested in accordance with ASTM E84.
      a. Flame Spread: 25 or less.
      b. Smoke Developed: 50 or less.

C. Tolerances:
   1. Deflection, ASTM C635: Maximum 1/360 of span. Applies to suspension system components, hangers, and fastening devices supporting light fixtures, ceiling grilles, and to acoustical panels.
   2. Allowable Tolerance of Finished Acoustical Ceiling System: Level within 1/8 inch in 10 feet.

2.3 SUSPENSION SYSTEMS

A. Comply with ASTM C635.

B. Structural Classification: Heavy-duty.

C. Main and Cross Members: Hot-dip galvanized cold-rolled steel, double-web design with rolled-steel cap.

D. Edge Moldings: Hot-dip galvanized, cold-rolled steel, minimum 0.020-inch-thick steel.
   1. Profile, Unless Otherwise Shown: Channel, minimum flange width of 15/16 inch.

E. Splices, End Connections, Clips, and Other Accessories:
   1. Hot-dip galvanized steel.
   2. Design to provide strong, rigid, lock-type connections preventing movement or displacement of joined components and permitting disassembly without damage to component parts.

F. Suspension Wire: ASTM A641, Class 1 zinc coating, soft temper.
   1. Hanger Wire: 0.106-inch nominal diameter (12 gage).
   2. Bracing Wire: 0.120-inch nominal diameter (10 gage).

G. Attachment Devices: Size for five times design load required by ASTM C635,Table 1, Direct Hung, unless otherwise indicated.

H. Compression Struts: Donn "Seismic Compression Post" or equal manufactured proprietary product conforming to specified requirements and those indicated on the Drawings.

I. Hold-Down Clips: Concealed, spring-loaded, fully accessible.

J. Finish:
   1. Steel components shall be Bonderized and given a coat of rust-inhibitive paint.
   2. Exposed surfaces of components shall have factory-applied semi-gloss white enamel finish, unless otherwise noted.
   3. Grid Color: White, unless otherwise specified.

K. Suspension and Grid Types: As listed in Product and Finish Schedule on Sheet A7.0.

2.4 ACOUSTICAL CEILING TYPES

A. Ceiling Types: As listed in Product and Finish Schedule on Sheet A7.0.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Pattern and layout shall be accepted by County’s Representative before installation of suspension systems.

B. Install suspension systems, including necessary hangers, grillage, and other supporting hardware in accordance with CBC, ASTM C636 and ASTM E580, manufacturer's instructions, and as specified. The most stringent requirements shall govern.

3.2 GRID SYSTEMS

A. Hangers:
   1. Coordinate hanger location with other work. Hanger wire attachment devices shall be capable of supporting 100 pounds.
   2. Ensure that hangers and carrying channels are located to accommodate fittings and equipment that are to be placed after installation of ceiling grid system.
   3. Space hanger wire as required by code for specified wire gage.
   4. Install additional hangers at ends of each suspension member, at light fixtures, and 6 inches from vertical surfaces.
   5. Do not splay wires more than 5 inches in a 4 foot vertical drop.
   6. Wrap wire at least three times horizontally, turning ends upward in the first 3 inches.
   7. Provide trapeze suspension or other appropriate system for suspension of ceiling system and light fixtures at large ductwork.
   8. Provide two extra tie wires at each light fixture and HVAC register for use in tying off opposite corners at fixtures and registers.
   9. Kinks and bends are not permitted in hanger wires to level carrying channels.

B. Main Runners:
   1. Space main runners at 4 feet on center.
   2. Level and square to adjacent walls.
   3. Independently support a maximum of 8 inches from each wall.
   4. Secure to structure above with four-way, bracing wire splays as specified and to meet applicable building code requirements for lateral design.

C. Space cross runners at 2 feet on center. Independently support if 8 inches or more from wall.

D. Use standard "Tee" section at grid change in direction.

E. Wall and Perimeter Moldings:
   1. Install wall molding at intersection of suspended ceiling and vertical surfaces.
   2. Miter corners where wall moldings intersect.
   3. Attach to vertical surface with concealed mechanical fasteners.

F. Seismic Bracing Assembly: Compression struts and splayed wires.
   1. Horizontal Restraints: 4 splayed wires oriented 90 degrees from each other.
      a. Seismic bracing wires may be 12 gage if permitted by code.
      b. Provide at the following locations and where shown:
         1) Not more than 12 feet on center in each direction.
         2) Not more than 6 feet from each perimeter walls and edges of vertical ceiling offsets.

c. Splices in bracing wires are not permitted.
d. Angle of wires shall not exceed 45 degrees from the plane of the ceiling.

2. Vertical Restraints: A strut to resist vertical displacement at each seismic splay.
   a. Struts shall extend from the grid to structure above and shall be fastened at both ends.
   b. Compression struts shall not replace hanger wires.
   c. If other than a manufactured proprietary strut is used, it shall be approved by governing authorities.
3. Lateral force bracing is not required at ceiling areas less than 144 square feet that are surrounded by walls extending to structure above.
4. Ceiling areas exceeding 2,500 square feet shall have a seismic separation joint with each area provided with closure angles.
5. Seismic perimeter clips shall have current and approved ICC-ES Report and shall be installed in accordance with the details and recommendations of the Report.
6. Provide spreader bars at all main and perimeter runners.

G. Provide bracing to top of ceiling-height partitions.

3.3 LAY-IN ACOUSTICAL PANELS AND CLOUDS

A. Install in level plane in straight line courses free from twist, warp and dents.

B. Apply with grain, if any, in same direction, not checkerboard.

C. Minimum Width of Border Panel: One-half panel dimension, unless indicated on the Drawings or approved submittals.

D. Provide trim molding at recessed troffer lights, edges of clouds, and elsewhere as required.

E. Hold-Down Clips:
   1. Acoustical panels surrounding recessed troffer lights shall be installed with hold-down clips to prevent movement or displacement of panels.
   2. Provide hold-down clips at perimeter where grid meets wall molding.
   3. Exposed fasteners are not acceptable.

F. Fit ceiling units in place, free from damaged edges or defects detrimental to appearance and function.
   1. Fit border units neatly against abutting surfaces.
   2. Trim or rout tegular-edge panels to provide tegular edge at perimeter moldings.

G. Coordinate lay-in system with electrical fixtures and mechanical work that will be integrated with the ceiling.

3.4 CEILING MOUNTED LIGHT FIXTURES AND HVAC TERMINALS

A. Secure with mechanical fasteners to the ceiling grid runners to resist a horizontal force equal to the weight of the fixture.

B. Independently support with wires to structure above as follows:
   1. Fixtures Less than 10 Pounds: One 12-gage wire from the fixture housing. This wire may be slack.
   2. Fixtures Between 11 and 55 Pounds: Two 12-gage wires attached to fixture and structure above. These wires may be slack.
   3. Fixtures 56 pounds and more shall be independently supported using 9-gage wire:
   4. Hangers shall be located within 6 inches of each corner.

C. Do not install fixtures that will eccentrically load main runners and cross runners. Where fixture installation would produce rotation of runners, provide stabilizer bars.

D. Fasteners shall be concealed in completed installation.

3.5 CLEANING AND ADJUSTMENT

A. Clean soiled or discolored surfaces after installation.

B. Adjust sags or twists which develop in ceiling systems, and replace any part which is damaged or faulty.
   1. Touch up scratches, abrasions, voids, and other defects in painted surfaces.
   2. Remove and replace damaged or improperly installed work.

END OF SECTION 09 51 00

SECTION 09 6500

RESILIENT FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Resilient flooring, including linoleum and static dissipative tile.
2. Resilient base.
3. Resilient edge trim and accessories.
4. Static control floor finish at static dissipative tile.

B. Related Requirements:
1. Portland Cement Underlayment: Section 03 54 15.
2. Tile Carpeting: Section 09 68 13; resilient accessories for carpet.
3. Electrical: Division 26; grounding of static dissipative tile.
4. Product and Finish Schedule: Sheet A7.0.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Layout and seaming diagrams for resilient sheet flooring. In preparing seaming diagram, keep seams to a minimum, and comply with the following:
1. Flooring shall be laid in the same direction unless specifically shown otherwise.
2. Seams run length of area.
3. Main traffic runs along length of seam.
4. Seams are away from areas subject to pivoting traffic.
5. Seams are not perpendicular to doorway openings.
6. Seams parallel to doors are centered directly under door.

B. Product Data: Manufacturer's technical data for each resilient product required.
1. Include profiles of resilient edge strips and reducers.
2. Include laboratory tests reports for flooring products showing compliance with specified slip resistance.

C. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 4:
         1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
         2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
         3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
      b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.
      c. Credit EQ 3.1 and EQ 3.2: Comply with Section 01 74 24 Construction Indoor Air Quality Management.
      d. Credit EQ 4.1:
         1) Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for field-applied adhesives and sealers used inside of the weatherproofing barrier of the building demonstrating compliance with SCAQMD Rule #1168.
         2) Manufacturer's product data for aerosol adhesives used inside of the weatherproofing barrier of the building, including printed statement of VOC content that demonstrates compliance with the limits defined in Green Seal Standard GS-36.
      e. Credit IEQ 4: Low-Emitting Materials – Flooring Systems: For adhesives, flooring system, and chemical-bonding compounds, documentation that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Samples:
   1. Each type, pattern, and color of resilient flooring material selected.
   2. Tile: Full-size.
   3. Sheet: 12 inches square or larger if requested by County's Representative.
   4. Accessories: 9 inches long by full dimension.

1.4 INFORMATIONAL SUBMITTALS

A. Statement of installer qualifications.

B. Verification that flooring meets specified requirements for slip-resistance.

C. Results of substrate moisture content tests.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data, including list of recommended maintenance products and procedures for each type of resilient flooring material.

B. Extra materials as specified.

C. Manufacturer's extended product warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Documented experience in installation of resilient flooring products similar to those specified.

B. Static dissipative flooring shall comply with NFPA 99 Class 1, with conductive range of 2.5×10^6 to 10^9 ohms per square.

C. Slip Resistance: Flooring, after application of any specified finishes, shall provide a value equal to or greater than 0.42 when tested in accordance with DCOF AcuTest procedure contained in ANSI A137.1:2012, Section 9.6.
   1. If manufacturer of selected flooring does not have test data to substantiate compliance with DCOF AcuTest value, provide alternative testing to verify compliance, including static coefficient value of 0.60 for level surfaces as determined by testing identical products in accordance with ASTM C1028, if acceptable to governing authorities.
   2. Laboratory tests shall be made on a minimum of samples of each material and finish proposed for use.

D. Mockups: First installed area or example of each type of resilient flooring shall serve as a mockup for review and approval by County's Representative of workmanship, visual effect, and interface with adjacent construction.

1.7 FIELD CONDITIONS

A. Ambient Conditions:
   1. Maintain temperature in spaces to receive resilient flooring between 70 and 90 degrees F for at least 24 hours before installation, during installation, and 48 hours after installation.
   2. Store resilient flooring materials in spaces where they will be installed for at least 48 hours before beginning installation.

3. Maintain minimum temperature of 55 degrees F for remainder of construction period.
4. Do not install flooring when relative humidity exceeds 45 percent.

B. Suitability of Substrate:
1. Concrete surfaces shall be subject to moisture content testing
2. Substrate shall be flat to within 3/16 inch in 10 feet and shall be such that finish floor will not show "telegraphing" of irregularities.

C. Install resilient flooring products after other finishing operations, including painting, have been completed.

1.8 EXTRA MATERIALS

A. Furnish additional floor-covering materials for replacement and maintenance. Furnish, in factory-packaged and –labeled cartons.
1. Flooring: 5 percent of square footage of each size, color, pattern, and type of material included in the work.
2. Base: Not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, profile, and size installed.

B. Supply extra materials from same production lots and color runs as used in work.

C. Deliver the extra material to Project just prior to Substantial Completion, and store as directed by the County.

1.9 WARRANTY

A. Manufacturer: Provide the County with manufacturer’s written standard warranty for each resilient flooring product, if available.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. Sustainable Design:
1. Adhesives applied inside of the waterproofing barrier of the building shall have VOC content equal to or less than the applicable VOC limits.
2. Provide materials with the highest levels of post-consumer and pre-consumer recycled content.
3. When available, provide materials extracted, harvested, recovered and manufactured within 500 miles of the project site.

2.2 MATERIALS

A. Manufacturers, Products, Patterns, Designs, and Colors: As scheduled in Product and Finish Schedule on Sheet A7.0.

B. General:
   1. Flooring shall:
      a. Be uniform in thickness and size.
      b. Have edges cut accurately and square.
      c. Be uniform in color, with variations in variegated patterns kept to a minimum.
   2. Flooring in any one continuous area shall be from the same lot and shall have the same shade and pattern.
   3. Provide each type of resilient product by a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.

C. Manufacturer's Installation Accessories: Provide cove stick, cap strip, gulley edge, and other accessories as shown and accepted by County's Representative.

D. Resilient Base: ASTM F1861, Type TP, rubber; Burke Flooring, Roppe, or equal.
   1. Provide premolded external corners, and exposed end units. Premolded units shall be ordered from same color run as base.
   2. Lengths: Roll.
   3. Provide coved base at resilient flooring, straight base at carpet.
   4. Height: 4 inches unless otherwise scheduled.

2.3 ACCESSORIES

A. Adhesives:
   1. Provide adhesives as recommended by manufacturer of resilient flooring material for conditions of installation and for each type of flooring.
   2. Adhesive shall meet VOC requirements.

B. Floor Patch-and-Leveling Compound: As specified in Section 03 54 15 Portland Cement Underlayment.

C. Heat Welding Rod for Linoleum: Forbo "Marmoweld" or equal.

D. Edge Strips: Molded vinyl in profiles as selected by County's Representative from manufacturer's standards. Unless otherwise specified, match thickness of abutting flooring material.

E. Metal Edge Protection: Extruded anodized aluminum.
   1. Manufacturers: Schlüter Systems, or equal.
   2. Height and Profile: As shown.

F. Accessories for Sheet Flooring:
   1. Cove Filler Strip: Vinyl strip; Mercer No. 070 by Burke Flooring, or equal.
   2. Base Cap Strip: Square profile, color as scheduled, or, if not scheduled, as selected by County's Representative; Mercer No. 390 by Burke Flooring or equal.

G. Static Control Finish: Metal cross linked acrylic floor dressing; "Static Control Floor Glaze" by VPI, 800-874-4240.

H. Vapor Retarder, if Required: 6-mil-thick polyethylene sheeting.

I. Primer: Nonstaining type as recommended by flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect substrate in order to verify that it is satisfactory. Substrate shall be:
   1. Free of excess moisture, as determined by testing.
   2. Smooth and free of cracks, holes, ridges, coatings preventing adhesive bond.
   3. Free of other defects impairing performance or appearance.

B. Perform moisture tests on concrete subfloors to verify that substrate is sufficiently dry.
   1. Perform tests as specified in order to determine the subsurface moisture content of the concrete slab to receive resilient flooring.
   2. Notify manufacturer's representatives so that they may observe the tests.
   3. The tests shall be performed at locations not more than 50 feet apart in every direction.
   4. Test method shall be as recommended by or as acceptable to the flooring manufacturer.
   5. If slab moisture content exceeds requirements of manufacturer, do not proceed with installation; and immediately notify the County's Representative for further direction.
   6. The method of testing shall be one of the following:
      a. Tape to slab a piece of clear polyethylene sheet, 4 mils thick x 24 inches square. Seal edges tightly to concrete, with sheet as close to slab surface as possible and with minimum amount of air trapped between sheet and slab. Suspend a minimum 300-Watt heat lamp, directed downward, 12 inches above center of sheet, for 4 hours. If beads of condensed moisture are larger than a match head, do not install resilient flooring.
      b. Using specified flooring, install panels 36 inches square, spaced approximately 50 feet apart, throughout subfloor area. If panels are securely bonded after 72 hours, subfloor surface is dry and sufficiently free of foreign material.
   7. If maximum slab moisture content recommendations or testing methods of flooring manufacturer are more stringent than above requirements, flooring manufacturer's requirements shall govern.

C. Perform bond tests to ascertain presence of substances detrimental to obtaining adhesive bond.

D. Air-Moisture Content Testing: Determine relative humidity of air in rooms to receive resilient flooring, using wet-bulb and dry-bulb sling psychrometer, to verify that relative humidity does not exceed 45 percent.

3.2 PREPARATION

A. Comply with ASTM F710 and manufacturer's recommendations for surface preparation.
   1. Use leveling and patching compounds, as recommended by resilient flooring manufacturer, for filling small cracks, holes, and depressions in subfloor to within specified tolerances and criteria.
   2. Remove protrusions, and grind smooth.
   3. Remove coatings that might prevent adhesive bond, including curing compounds incompatible with resilient flooring adhesives.
   4. Steel troweled concrete shall be properly roughened-up (sanded) to ensure suitable adhesion.
   5. Vacuum surfaces to be covered.

B. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive. Apply in compliance with manufacturer's directions.

3.3 APPLICATION OF ADHESIVES

A. Mix and apply adhesives in accordance with manufacturer's instructions. Prime surfaces if recommended by adhesive manufacturer.

B. Apply uniformly over substrates.
   1. Cover only that amount of area that can be covered by flooring material within the recommended working time of adhesive.
   2. Remove any adhesive that dries or films over.
   3. Do not soil walls, bases, or adjacent areas with adhesive.
   4. Promptly remove any spillage.

C. Apply adhesives with notched trowel or other suitable tool.

D. Clean trowel, and rework notches as necessary to ensure proper application of adhesive.

3.4 INSTALLATION OF GROUNDING STRIPS FOR STIC DISSIPATIVE TILE

A. Verify SDT adhesive is dry-to-touch as determined by testing method recommended by adhesive manufacturer.

B. Cut copper grounding strips into two-foot strips.

C. Provide one strip for each 1000 square feet of area at slabs on grade and one for each 500 square feet of area at floors above grade. Locate strips at perimeter of space and at locations that will facilitate grounding.

D. Place 18-inches of strip over the dry-to-touch floor adhesive with the remaining 6 inches turning up the wall.

E. Apply an additional coat of SDT adhesive over the section of strip on the floor and allow adhesive to dry-to-the touch before proceeding with installation of tile.

F. Grounding connection shall be provided under Division 26, "Electrical," by connecting to steel support columns or by connection to ground bus by #12 or #14 wire.

3.5 INSTALLATION OF TILE FLOORING

A. Lay tile from center of room or space, working toward perimeter.
   1. Lay tile parallel to room axis in straight courses, with cross joints perpendicular and straight.
   2. Lay tile with grain or pattern running in checkerboard pattern or in same direction, as directed by County's Representative.
   3. Do not lay tile less than one-half width of a field tile, except where accepted by County's Representative for irregularly shaped rooms or spaces.

B. Fit tile neatly and tightly into breaks and recesses, against bases, around pipes and penetrations, under saddles or thresholds, and around permanent cabinets and equipment. Cut tile neatly and accurately to fit within 1/64 inch of abutting surfaces.

3.6 INSTALLATION OF SHEET FLOORING

A. Install flooring using adhesives, in accordance with manufacturer's instructions and reviewed submittals.
   1. Lay all sheets in single length from wall to wall.
   2. Extend flooring into recesses, door reveals, closets, and similar spaces. Resilient flooring shall fit neatly into doorframes and around corners and other obstructions.
   3. Lay sheets with seams square to room axis. Match patterns at seams.

B. Install self-coved base where indicated on the Drawings. Provide cove filler strip backing at radius bend and a cap binding strip at the top edge.

C. Make all seams tight, and solidly adhere to substrate. Provide welded seams where seam welding is appropriate for product and acceptable to manufacturer. Comply with manufacturer's recommendations for welding.

D. Finished floors shall be smooth and free from buckles, cracks, breaks, waves, and projecting edges.

3.7 INSTALLATION OF BASE AND EDGE STRIPS

A. General:
   1. Match edges at seams, or double-cut adjoining lengths.
   2. Install with tight butt joints.
   3. Maintain minimum measurement of 18 inches between joints.

B. Top-Set Base:
   1. Install base around perimeter of room or space at base of partitions, columns, pilasters, and other permanent fixtures where scheduled.
   2. Unroll base material, and let relax.
   3. Cut into accurate lengths as required for minimum number of joints.
   4. Apply adhesive, and firmly adhere to wall surfaces.
   5. Press down so that bottom cove edge follows floor profile.
   6. Corners:
      a. Miter internal corners.
      b. Use premolded corners for external corners.
   7. Use premolded units at exposed ends.
   8. Scribe base accurately to abutting materials.

C. Edge Strips:
   1. Apply adhesives, and bond securely to substrates in straight, true lines.
   2. Provide where resilient flooring terminates, exposing edge of covering.
   3. Center edge strips under doors where resilient flooring terminates at a door opening.
   4. Top of strips shall be flush with top of resilient flooring.
   5. Install reducer strips where required to provide smooth transition between resilient flooring and other finish.

3.8 FINISHING AND CLEANING

A. Clean approximately 72 hours after installation, or after adhesives have cured and after completion of adjacent work, as recommended by manufacturer for type of flooring installed.
   1. Sweep or vacuum floor thoroughly.
   2. Clean surfaces with a neutral cleaner.
   3. Follow manufacturer's recommended procedure for cleaning and polishing.
   4. Remove excess adhesive and other surface blemishes, using appropriate recommended cleaner.

B. Application of Static Control Finish: Apply to resilient flooring where directed. Comply with manufacturer's written instructions summarized as follows:
   1. Clean completed flooring with neutral cleaner.
   2. Apply finish using mops.
   3. Apply two thin coats allowing first coat to dry thoroughly before re-application.
   4. When dry, final coat shall be machine buffed to a moderate luster.

C. Protect flooring against damage and from normal wear and tear during construction period, in accordance with flooring manufacturer's directions, so that flooring will remain without indication of use or damage.
   1. Protect flooring by covering with nonstaining building paper.
   2. Protect flooring against rolling loads by covering with plywood or hardboard. Use dollies to move stationary equipment or furnishings across floors.

END OF SECTION 09 65 00

SECTION 09 68 13

TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Carpet tile, complying with environmental performance requirements of County Document 09 68 00 and 09 68 10, "Carpet Technical Specification for Construction Documents for Alameda County, CA."
   2. Carpet accessories.

B. Related Requirements:
   1. Portland Cement Underlayment: Section 03 54 15; leveling compounds.
   2. Resilient Flooring: Section 09 65 00; concrete moisture testing.
   3. Product and Finish Schedule: Sheet A7.0.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
   3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

B. Sequencing and Scheduling: Sequence carpet installation with other work to minimize possibility of damage during remainder of construction period.

1.3 ACTION SUBMITTALS

A. Shop Drawings:
   1. Submit diagrams showing layout of joints. Show drawing scale, floor and building location, compass direction, colors and patterns for each area, and location and type of edge moldings.
   2. Show installation details for:
      a. Locations where cutouts are required in carpet.
      b. Edge strips.

B. Product Data:
   1. Data on proposed products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
   2. Product literature for each type of installation accessory required.
   3. Data on durability, fading, and flame resistance.

4. Information on carpet resistance to soiling and topical coating.

C. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 4:
         1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
         2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
         3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
      b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.
      c. Credit EQ 3.1 and EQ 3.2: Comply with Section 01 74 24 Construction Indoor Air Quality Management.
      d. Credit EQ 4.1:
         1) Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for field-applied adhesives and sealers used inside of the weatherproofing barrier of the building demonstrating compliance with SCAQMD Rule #1168.
         2) Manufacturer's product data for aerosol adhesives used inside of the weatherproofing barrier of the building, including printed statement of VOC content that demonstrates compliance with the limits defined in Green Seal Standard GS-36.
      e. Credit EQ 4.3: Documentation for carpet indicating compliance with testing and product requirements of Carpet and Rug Institute's "Green Label Plus" program.
         1) Include statement indicating costs for each product.

D. Samples:
   1. Tile: Full-size carpet tile of each type and color required. Samples shall be reviewed at the Project site.
   2. Edge Stripping and Separator: 9-inches-long of each type.

1.4 INFORMATIONAL SUBMITTALS

A. Installer qualifications.

1.5 CLOSEOUT SUBMITTALS

A. Extended warranties.

B. Maintenance instructions.

C. Extra stock.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Firm specializing in carpet installation, with not less than 5 years of experience in installation of carpeting similar to that required for this Project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Follow manufacturer's recommendations for special delivery, storage, and handling of materials.

B. Ambient Conditions:
   1. Store carpet tiles at least 3 days prior to installation in area of installation to achieve temperature stability.
   2. Follow CRI 104 Standard of room temperature between 65 and 95 degrees F, and relative humidity between 10 and 65 percent.
   3. Temperature of concrete slab substrate shall not be less than 65 degrees F.
   4. Maintain these conditions at least 48 hours prior to installation and 72 hours after completion.

C. Do not stack carpet tile boxes more than six cartons high to avoid potential crushing.

D. Comply with additional requirements specified in Section 01 43 00 Quality Assurance – Materials and Equipment and Section 01 65 00 Delivery, Storage and Handling.

1.8 WARRANTY

A. Contractor: Written guaranty, executed by the Contractor and installing subcontractor agreeing to repair, replace, or reset carpeting that fails in installation materials or workmanship within the specified warranty period.
   1. Guaranty Period: 2 years.

B. Manufacturers:
   1. Carpet Fiber Manufacturer:
      a. Submit carpet fiber manufacturer's warranty against surface pile abrasive wear (fiber loss) in excess of 10 percent for 10 years from date of installation.

b. Submit carpet fiber manufacturer's lifetime antistatic warranty.

2. Carpet Manufacturer:
   a. Subfloor Warranty: Submit carpet manufacturer's warranty that backing material will not react adversely with subfloors over which carpet is to be installed including adhesives, concrete, and other chemicals.
   b. Latent and Patent Defects: Carpet manufacturer shall warrant carpet tiles against product failure after installation including, but not necessarily limited to:
      1) Tiles not being cut true and square.
      2) Pile fuzz.
   c. Dimensional instability such as shrinkage, cupping and doming which adversely affect the ability of the tile to lay flat.
   d. Delamination.
   e. Edge ravel.

C. Warranties shall include removal, replacement, and installation of new carpet tile at no cost to the County.

1.9 MAINTENANCE

A. Maintenance Instructions:
   1. Submit manufacturer's printed instructions for maintenance of installed work, including recommended methods and cleaning frequencies for maintaining optimum conditions of materials under anticipated traffic and exposures.
   2. Include precautions against materials and methods detrimental to carpet performance or to topical coating or to latex used between backings.

B. Replacement Materials: After completion of work, deliver not less than 10 percent, to next full carton, of each carpet tile type, color, and pattern installed.
   1. Furnish accessory components as required.
   2. Furnish from same production run as materials installed.
   3. Package replacement materials in full cartons of approximately 20 tiles, clearly identified by appropriate labels including dye lot number.
   4. Deliver and store in accordance with instructions provided by the County.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. Construction:
   1. Type: Tufted or fusion bonded.
   2. Pile Weight (BCF): 28 ounces per square yard, minimum.
   3. Size: 18 inches x 18 inches.
   4. Static Control Fiber: Conductive carbon composite nylon filament.
   5. Face yarns shall be of same dye batch, and finish material shall be of one mill run.

B. Finished carpet tiles shall be rotary sheared to eliminate "fuzzing" and airborne fibers.

C. Tufted Cut Pile (If Selected):
   1. Tufts shall have at least a 75 percent encapsulation with latex to prevent fibre slippage.
   2. Tufts shall have a good tuft bind.
   3. Dye Methods:
      a. Yarn: Yarn dyed.
      b. Pattern: Printed.
   4. Gage: 1/10 or tighter.
   5. Weight Density Factor: Not less than 400,000.
   6. Backings: Manufacturer's option conforming to performance requirements specified.

D. Bonded Cut Pile(If Selected):
   1. Dye Methods:
      a. Yarn: Yarn dyed.
      b. Pattern: Printed.
   2. Weight Density Factor: Not less than 400,000.

E. Performance Requirements:
   1. Dimensional Stability (AATCC-16E): Equal or greater than 0.2 percent.
   2. Flammability:
      a. DOC FF-1-70: Pass.
      b. NFPA 258 (Smoke Density): 450 or less.
      c. ASTM E648 (Floor Radiant Panel Test): 0.45 or higher.
   3. Static Control: AATCC 134 (Electrostatic Propensity of Carpet). Carpet shall develop less than 3.5 kilovolts of static at 70 degrees F and 20 percent humidity.
   4. Colorfastness, Xenon Arc, AATCC 16E: Not less than 4.
   5. Atmospheric Fading: AATCC Test Method 129 - Ozone, and AATCC Test Method 23 - Burnt Gas; Minimum shade rating after two cycles in each shall be no less than an International Grey Scale Rating of 3.
   6. Crockfastness: AATCC Test Method 164. Minimum stain ratings, International Grey Scale shall be: Wet -4; Dry - 4.
   7. Carpet shall have a very good surface tension to prevent rapid soiling.
   8. Pile shall be of even height and well formed with good twist. Twist in yarn shall be heat set to prevent loss of texture.

F. Odor: Materials used in construction of carpet tiles shall not give off any odors which could be unpleasant or hazardous to building occupants. This shall include offgassing and chemical migration in backing materials.

G. Pattern Application, if Applicable:
   1. Registration shall be precise so that no pattern mismatch is evident after installation.
   2. Definition of pattern shall be sharp with no halo or bleeding of color; match definition quality of approved samples.

3. Consistency shall be such that any tile shall be interchangeable with any other tile, within a dye lot, with no visual difference.

B. Sustainable Design: Carpet shall be certified to meet the requirements of "Green Label Plus" by the Carpet Research Institute (CRI), with VOCs totaling 500 micrograms per square meter per hour, or less.

H. Carton Labeling: Mark each carpet tile carton according to style, color, pattern, pile direction and dye lot.

2.2 CARPET TILE

A. Manufacturer, Products, Patterns, and Colors: Plank style carpet tile as scheduled Product and Finish Schedule on Sheet A7.0.

2.3 ACCESSORIES

A. Adhesives: Release type, waterproof, with no adverse effects on indoor air quality by Re:Source Technologies, or equal acceptable to the carpet and carpet backing manufacturers and meeting the VOC requirements.

B. Metal Edge Strips: As specified and provided under Section 09 30 00 Tiling.

C. Resilient Edge Strips: Vinyl, with integral color.
1. Profiles and Colors: As scheduled or, of not scheduled, as selected by County's Representative.

D. Noncombustible Carpet Separator: Extruded aluminum; Pemko #236 or equal.
1. Finish: To match other exposed accessories.

E. Additional Materials: As recommended by carpet manufacturer and as selected by installer to meet Project circumstances and requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect substrate in order to verify that it is satisfactory. Substrate shall be:
1. Free of excess moisture, as determined by testing.
2. Smooth and free of cracks, holes, ridges, coatings preventing adhesive bond.
3. Free of other defects impairing performance or appearance.
4. Smooth and flat with maximum variation of 1/4 inch in 10 feet, noncumulative

B. Verify that concrete surface tolerance meets requirements specified in Section 03 30 00 Cast-in-Place Concrete. If necessary, install Portland cement underlayment as specified in Section 03 54 15 Portland Cement Underlayment.

C. Perform moisture tests on cementitious subfloors, as specified in Section 09 65 00 Resilient Flooring, to verify that substrate is sufficiently dry.
   1. Notify manufacturer's representatives so that they may observe the tests.
   2. The tests shall be performed at locations not more than 50 feet apart in every direction.
   3. Test method shall be as recommended by or as acceptable to carpet manufacturer.
   4. If slab moisture content exceeds requirements of manufacturer, do not proceed with installation; and immediately notify the County's Representative for further direction.

D. Perform bond tests to ascertain presence of substances detrimental to obtaining adhesive bond.

E. Promptly notify County's Representative in writing of any conditions detrimental to installation.

F. Do not proceed with installation until substrate conditions that do not meet requirements of the carpet manufacturer have been corrected or mitigated.

3.2 PREPARATION

A. General:
   1. Follow carpet manufacturer's recommendations and instructions to ensure that each substrate is properly prepared to receive type of carpet to be installed.
   2. Fill cracks, gaps, and depressions using specified materials and methods.
   3. Level off high spots or ridges to prevent excessive carpet wear.
   4. Provide leveling compound where necessary. Install with minimum 4-foot feather.

B. Check substrates to ensure that no dusting will occur through installed carpet. Apply sealer on porous concrete surfaces where required to prevent dusting.

C. Vacuum-clean substrates thoroughly immediately before installation.

D. Maintain floor temperature and relative humidity at levels and for periods recommended by carpeting manufacturer or the CRI 104 Standards or 48 hours prior to installation, day and night during installation, and 72 hours after installation.

3.3 INSTALLATION

A. General:
   1. Apply in accordance with manufacturer's instructions and requirements of CRI 104.
   2. Install under open-bottomed obstructions and under removable flanges and furnishings.
   3. Integrate and blend carpet tiles from different cartons to ensure minimal variation in color match.

4. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
5. Extend carpet into alcoves and closets of each space.
6. Within each continuous carpet area, install tiles from same dye lot.
7. Provide noncombustible carpet separator where carpet is to be installed on both sides of a fire door, except at 20-minute-rated assemblies.

B. Measuring: Determine center of room or space using standard layout methods and building grid lines where possible.

C. Installing Tiles:
1. Layout: As recommended by manufacturer for specified carpet tile.
2. Determine starting point.
3. Snap chalk line across space, and divide into four squared sections.
4. On both sides of each chalk line, apply a strip of adhesive, at least 5 inches wide, using a twist-textured paint roller. When adhesive is dry or tacky, begin installing each section in pyramid fashion, starting from center and working outward.
5. Install additional tiles within quadrant using stair-step technique. Tiled area grows steadily away from center of space, not growing along either chalk line but rather along an imaginary diagonal line between them. Installation continues to grow from center to corner of space, finishing an entire quadrant before starting the next quadrant.

D. Joints:
1. Join tiles snugly together. Continually check that tiles are being placed together with correct firmness.
2. See "Field Quality Control" below for snugness testing.

E. When placing tiles, brush face pile back from edge, and tip tile into place to prevent pile yarns from becoming entrapped in joint.

F. Control Grid:
1. Throughout installation, provide a control grid at 15-foot intervals to keep tiles from shifting.
2. Control grid consists of a row of tiles anchored in place with the same adhesive used to align center line tiles. This strip of adhesive shall be approximately 15 feet from center line adhesive. Always place adhesive around perimeter of area.

G. Install carpet tiles with 100 percent adhesive coverage at:
1. Perimeter of spaces.
2. Cut tiles.
3. High traffic lanes.

H. Locate change of color or pattern between rooms under door center line.

I. After installation, carpet tiles within a continuous carpet area exhibiting a difference in appearance due to color or light reflectance variation attributed to the manufacturing process shall be selectively relocated or replaced.

3.4 FIELD QUALITY CONTROL

A. Snugness Testing:
   1. Measure distance along ten installed tiles. There should be a 1/4 inch gain in distance along ten installed tiles.
   2. If gain is less than 1/4 inch, peaking of tiles can occur. A wide gap between tiles may occur if gain is more than 1/4 inch.

3.5 CLEANING

A. Remove and dispose of trimmings, excess pieces of carpet, and laying materials from each area as it is completed.

B. Vacuum carpet using commercial machine with face-beater element unless otherwise recommended by carpet manufacturer.

C. Remove spots. Replace carpet tiles where spots cannot be removed. Do not get solvent used for cleaning into carpet backing system.

D. Use sharp scissors to remove protruding face yarn.

3.6 PROTECTION

A. Do not allow construction traffic to traverse completed work.

B. Protect material and equipment after installation.
   1. Provide 6-mil-thick polyethylene covering with taped joints as necessary to protect installed products from environmental conditions, damage from traffic, and subsequent construction operations.
   2. Protect paths used for movement of pallets or heavy loads with tempered hardboard.
   3. Remove protection when no longer needed, unless otherwise specified or noted by the County's Representative.

END OF SECTION 09 68 13

SECTION 09 72 00

WALL COVERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Vinyl-coated fabric wall covering.
   2. Additional wall coverings as scheduled, if not specified elsewhere.

B. Related Requirements:
   1. Gypsum Board: Section 09 29 00.
   2. Acoustical Wall and Ceiling Finishes: Section 09 83 10.
   3. Paints and Coatings: Section 09 90 00; priming of surfaces to receive wall covering.
   4. Product and Finish Schedule: Sheet A7.0.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
   3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Manufacturer's specifications and installation instructions.
   2. Evidence or certification that materials comply with specified requirements.

B. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 4:
         1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.

2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.

b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

c. Credit EQ 4.1:
1) Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for field-applied adhesives and sealers used inside of the weatherproofing barrier of the building demonstrating compliance with SCAQMD Rule #1168.
2) Manufacturer's product data for aerosol adhesives used inside of the weatherproofing barrier of the building, including printed statement of VOC content that demonstrates compliance with the limits defined in Green Seal Standard GS-36.

d. Credit EQ 4.2: Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for all paints and coatings used inside of the weatherproofing barrier of the building and demonstrating compliance with Green Seal standard GS-1.

C. Verification Samples: 6-inch-square samples of each wall covering taken from dye lot proposed to be furnished.

1.4 CLOSEOUT SUBMITTALS

A. Manufacturer's printed maintenance instructions.

B. Extra stock as specified.

C. Extended warranty.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Qualified and experienced in wall covering work of the type required for this Project.

B. Mockup:
1. Three-full width installed panels of each wall covering will be used as a test panel in an area designated by the County's Representative for review of quality of workmanship and interface with adjacent construction.
2. Test panels found deficient shall be removed and replaced at no additional cost to County.
3. Approved panels shall be the standard for comparison for the Project and, where appropriate, may be incorporated into the work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store wall covering and adhesives in manufacturer's original, unopened packages, clearly identified with manufacturer's name, brand name, quality or grade, and fire hazard classification.

B. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

1.7 FIELD CONDITIONS

A. Maintain ambient conditions required of wall covering manufacturer in space to receive wall covering before, during, and 48 hours after installation.

1.8 EXTRA STOCK

A. Coordinate material takeoff with County's Representative to ensure that an appropriate quantity of each type, pattern, and color of wall covering will be made available to County as attic stock after installation.
   1. Provide extra stock in full rolls, properly wrapped and clearly labeled.
   2. Deliver to County as directed by County's Representative.

1.9 WARRANTY

A. Manufacturer: Provide County with manufacturer's written 3-year warranty against mildew or fungus growth caused by adhesive and primer.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. Regulatory Requirements:
   1. Wall coverings shall be Class A in accordance with NFPA 255, "Method of Test Surface Burning Characteristics of Building Materials."
   2. In addition to complying with other legal requirements, comply with National Fire Protection Association (NFPA) NFPA 101, Chapters 6 and 17.

B. Imperfections in appearance or other features not in conformance with the specified materials which appear in either the submitted samples or materials delivered to the Project site will be cause for rejection by the County's Representative.

C. Visibly defective panels shall not be installed.

D. Horizontal seams are not permitted.

E. Wall covering shall wrap beyond inside and outside corners not less than 6 inches.

2.2 MATERIALS

A. Wall Covering:
   1. Heavy duty fabric-reinforced vinyl, as listed in Product and Finish Schedule on Sheet A7.0.
   2. Additional wall covering products as listed in Product and Finish Schedule on Sheet A7.0.

B. Adhesive:
   1. Heavy-bodied, water-soluble paste manufactured expressly for use with the wall covering furnished and recommended by the wall covering manufacturer.
   2. Adhesive shall contain a mildew inhibitor and shall be VOC compliant.

PART 3 - EXECUTION

3.1 PREPARATION

A. Gypsum board shall be finished to a Level 5 finish, plumb, true, free of bumps, indentations, or other defects, and shall have been primed.

B. Unroll wall covering and allow to it to relax as recommended by manufacturer prior to installation.

3.2 INSTALLATION

A. Apply adhesive and apply wall covering in accordance with wall covering manufacturers' printed instructions, including using rolls in consecutive numerical sequence and placing panels in exact order cut from roll.

B. Within 3 hours of installation, inspect for bubbles and trapped air and correct deficiencies.

END OF SECTION 09 72 00

SECTION 09 80 00

ACOUSTICAL TREATMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Acoustic and Vibration isolation devices, details and procedures.

B. Conform to the requirements of Division 01, as well as the General Conditions, and any Special Conditions of the contract.

1.2 REFERENCE

A. Published specifications standards, tests or recommended methods of trade, industry or governmental organizations apply to work in this section where cited below:
   1. ASHRAE – American Society of Heating Refrigeration and Air Conditioning Engineers:
      a. Standard 36 – Determination of Ventilating Equipment Sound Power.
   2. ANSI – American National Standards Institute
      a. Standard S1.13 – Precision Methods for the Determination of Sound Power Levels of Broadband Noise Sources in Reverberant Rooms.
      b. Standard S1.1 – Acoustical Terminology
   3. AMCA – Air Movement and Control Association
      a. Standard 300 – Determination of Sound Power Levels
   4. ARI – American Refrigeration Institute Standards:
      a. Standard 575 – Measurement of Sound in Equipment Rooms
      b. Standard 885 – Sound Transmission Loss
   5. ISO – International Standards Organization
      a. Standards 5135 and 3741 – Acoustics
   6. ASTM – American Society for Testing and Materials:
      a. Standard E477 – Test for Duct Lining and Silencer Performance
      b. Standard E1332 – Standard Classification for Determination of Outdoor-Indoor Transmission Class (OITC)
      c. Standard C423 – Method for Measuring Sound Absorption
      d. Standard E90 – Method for Measuring Sound Transmission Loss
      e. Standard E 989 – Determination of Impact Insulation Class (IIC)
   7. SMACNA – Sheet Metal and Air Conditioning Contractors National Association:
      a. Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems

1.3 DEFINITIONS

A. For definitions of acoustical and vibration terms see ANSI Standard S1.1-1994.

1.4 DESIGN CRITERIA

A. Systems operation to result in no vibration of any elements of building or systems which is detectable to persons of normal sensitivity within occupied spaces.

B. Mechanical systems operation to result in noise levels, expressed as Noise Criteria (NC) levels, not greater than the following:

1.	Lobbies	NC 35
2.	Corridors	NC 40
3.	Private Offices	NC 30
4.	Conference Rooms	NC 30
5.	Teleconference Rooms	NC 25
6.	Open Office	NC 35
7.	Kitchen/Break Rooms	NC 40
8.	Library	NC 30

C. Bathroom and kitchen exhaust fans: 2.0 Sones maximum.

D. All equipment shall be selected and mounted or supported in such a manner as to prevent vibration or objectionable noise within the occupied spaces. All critical machines shall be isolated from the structure by combination spring and neoprene vibration isolators. Building resonance and deflection of floors shall be taken into consideration in the isolator selection. Flexible connectors shall be used for all duct and pipe connections at fans and equipment, and the duct and pipe shall be anchored at the free end next to the flexible connector. Vibration isolate all supply and return piping in mechanical rooms, within 50 feet of machines and at all risers and floor penetrations.

E. The noise levels for all equipment connected by louvers, areaways, etc., to the outdoors shall be attenuated so as to comply with the City of Oakland Noise Ordinance and any other applicable code or regulation.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver insulation materials, sealants, seals, doors and vibration isolation materials in manufacturer's unopened containers or packages, fully identified with trade name, type, class, and other identifying information. Store above grade and protect from weather and damage from any source.

B. Do not expose plastic materials to sunlight except to extent necessary for period of installation and concealment. Protect against ignition at all times.

PART 2 - PRODUCTS

2.1 ACOUSTICAL MATERIALS

A. Duct Liner: Glass fiber material with black pigmented dense face layer or fire resistant coating on exposed face, 3 lb/cu ft density, 1 inch thickness in supply ducts, 2 inch thickness in transfer ducts and plumbing, flame spread 25 or less per ASTM E84, UL listed, Owens Corning Fiberglas Aeroflex duct liner, Certainteed, Schuller, Owens-Corning Fiberglas, Knauf or equal.

B. Vibration Isolation Devices: MASON, Kinetics, Vibro-Acoustics.

C. Acoustical Sealant (Caulk): Permanently plastic, non-hardening, non-skinning, non-bleeding, non-staining sealant, fire-rated; "Acoustical Sealant", as manufactured by Tremco, United States Gypsum Sheetrock Acoustical Sealant (www.usg.com), •3M Fire Barrier Sealant CP 25WB+ www.3M.com , Presstite Products, or equal.

D. Outlet Box Acoustical Backing Pads: Resilient pads, composed of polybutene-butyl and inert fillers, "Lowry Outlet Box Pads", Harry A. Lowry & Associates, Van Nuys, California 91406; Nelson Fire Rated FSP Putty Pads manufactured by EGS Electrical (www.nelsonfirestop.com); BioStop Fire Rated Putty Pads (www.biofireshield.com); SpecSeal Putty Pads (www.stifirestop.com); IsoBacker Outlet Backer Pad by Kinetics Noise Control (www.kineticsnoise.com) or equal.

E. Supply water piping: 1 inch in diameter or smaller, use the Acousto-Plumb system of orange and blue plastic pipe isolators, holders, and guides, as manufactured by Specialty Products, Company, tel. (714) 828-9370, Hubbard's Holdrite Silencer Pipe support system (www.holdrite.com) or equal.
   1. Alternatively, wrap pipe in sections where fastening to the structure is necessary or where piping penetrates structural members with short sections of closed-cell neoprene sleeves ¼" minimum thickness such as Armacell's AP/Armaflex (www.armacell.com) or equal and attach piping to structure with oversized clamps.

F. Waste Piping: Isolate waste pipes with 1 inch thick neoprene pads under pipe clamps at floor penetrations. At anchor points other than floor penetrations provide the Elmdor Stoneman Trisolator system (www.elmdorstoneman.com) or approved equivalent.

G. Water Hammer Arresters: Provide Zurn (www.zurn.com) or Josam (www.josam.com) shock absorbers at all solenoid operated fixtures, at flush valve operated fixtures and at fixtures located at the end of long pipe runs. Size per manufacturer's recommendations and PDI Standard.

H. Resilient Channels: Use only ClarkDietrich Single-Leg 25 Ga type RCSD RC Deluxe (http://www.clarkdietrich.com/products).

I. Sound Isolation Clips: Kinetics IsoMax (www.kineticsnoise.com), Pac International RSIC-1 (www.pac-intl.com), or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. PIPING MATERIAL
1. Plastic piping for waste or drain lines should be avoided. If PVC piping or other plastic pipe is used for waste lines, then pipe must be fully wrapped with acoustical pipe wrap such as that manufactured by Lowry (Harry A. Lowry & Associates, Van Nuys, California 91406).
2. Cast iron waste lines should be used where piping is concealed in walls adjacent to all noise-critical areas such as conference rooms, offices, etc.
3. The following recommendations are based on the use of copper piping for supply water lines. Please advise if PEX or CPVC piping is planned for this project.

B. PIPE ISOLATION
1. All supply lines shall be mechanically isolated from the building structure by means of resilient pipe isolators, such as Acousto-Plumb by LSP Specialty Products (www.lspproducts.com) or the Hubbard HoldRite Silencer family of products (www.holdrite.com). Larger piping can be isolated by means of sections of closed neoprene sleeves such as AP/Armaflex (www.armaflex.com). No strap hangers, punched tape or wire should be used to support piping of any kind directly, without the use of one of the isolation systems recommended. Many manufacturers, including LSP Specialty products also make standard plastic isolators as part of other product lines that are NOT designed for noise control and are thus NOT acceptable for this use.
2. All new waste lines or those exposed during construction must be isolated, including waste lines suspended from concrete decks.
3. Isolation pads should also be used where piping, pipe connectors, or valves may contact framing, ductwork, structure, studs, gypsum board, or other pipes. Acceptable pads include Holdrite isolation liners #270 and #271, or 1/8″ thick, 40-durometer rubber strips.
4. Metal and strap hangers must be fitted with neoprene isolating material between the strap and pipe, such as Holdrite isolation liners #270 and #271 or 1/8″ thick, 40-durometer rubber collars.
5. Riser clamps for supply and waste lines shall be isolated from the structure using Mason Super W neoprene waffle pads or Holdrite #274 pads, or equal under a load bearing metal plate, or with the Hubbard HoldRite Silencer Model #276 isolation system.
6. No piping system shall contact another system, electrical conduit, or boxes. Any contact caused by misalignment of piping will require correction.
7. Piping supported by Trapezes can either be isolated individually by means of the isolation clamps indicated in 3.01.B.1 above, or the entire trapeze can be isolated

at the supporting rods by means of isolation hangers such as Kinetics FH (www.kineticsnoise.com).

C. PLUMBING SYSTEM

1. Select and install all plumbing system elements including but not limited to plumbing fixtures, connections, fittings, piping and pumps to minimize noise and vibration transmission into the building structure.
2. Do not locate supply pipes closer than 2 inches or waste water pipes closer than 1 inch from gypsum board in walls or ceilings of acoustically sensitive rooms such as private offices, conference rooms, etc.
3. Stub-outs for showers, sink and water closet plumbing shall be resiliently mounted to provide a plumbing connection that is acoustically isolating. Carefully follow directions of pipe isolation system manufacturers.
4. Use sleeves such as Specialty Product's Acousto-Sleeve or equal at all stub-out points where pipes traverse gypsum walls. Carefully follow manufacturer's installation instructions.
5. Provide water hammer arrestors at all solenoid valve operated fixtures, devices, equipment, and appliances (dishwashers), and flush valve operated fixtures.
6. Install 3-1/2-inch batt insulation in otherwise un-insulated stud and joist spaces containing water piping.
7. Pressure Regulator: Provide pressure regulator in domestic water supply line to limit pressure to 60 psig at all fixtures.
8. Size supply piping to maintain maximum water-flow rates at 4 feet per second (FPS) in ½-inch to 1-inch diameter, 6 FPS in 1-¼″ to 3″ diameter branch sizes. For pipes 4 inch diameter and larger, maximum allowable flow rate is 8 to 10 FPS.

D. PIPE PENETRATIONS

1. Pipes passing through plates, studs, floor joists, etc. shall have holes ½" minimum larger than the pipes' OD (i.e., ¼" minimum clearance all around), making sure that the pipe remains mechanically isolated after construction. Care must be exercised to avoid contact between isolated piping and framing in those places where a resilient insert is not used. Center pipes within the holes at all penetrations. If mechanical contact occurs, then the vibration isolation will be severely compromised.
2. Trades installing wall finishes should keep tiles/wall finishes away from pipe stub outs and penetrations and must caulk gaps with acoustical sealant.
3. There shall be no rigid connections between drain pipes and any areas of wall or ceiling assemblies. The hole for drain pipes shall be oversized and either stuffed with insulation to form a collar, filled with caulk, or the section of pipe wrapped with a sleeve of 40 durometer rubber. Spray foam is not acceptable, as it will harden over time.
4. Use a "red" colored fire rated acoustical caulking to seal pipe penetrations through fire rated walls and floor plates. Acceptable products are: 3M Fire Barrier Sealant CP 25WB+ (www.3M.com), Hilti FS ONE (www.hilti.com), or equal.

5. Do not use regular gypsum drywall compound to fill gaps between drywall and penetrating pipes. Use only permanently resilient, non-hardening, fire rated compounds such as USG Acoustical caulk or the red endothermic acoustical caulks indicated under subsection 3.01.D.4 to fill these gaps. Use sleeves such as Specialty Product's Acousto-Sleeve at all stub-out points where pipes traverse gypsum walls. These sleeves should be fitted temporarily on the pipe to allow the drywall contractor to finish the opening with drywall compound. The sleeve should then be removed and a resilient escutcheon inserted in its place

E. PARTITION SEALING: Caulk perimeter, joints and penetrations of gypsum board areas of sound rated walls as follows unless otherwise shown:
   1. At sound rated partition walls, provide continuous beads of acoustical sealant at juncture of face layers of gypsum board on both sides with floor and between wall and the partition top, and wherever wallboard abuts dissimilar materials (i.e., doors and windows). Caulk after installation of wallboard. Size and place beads as shown on drawings and as recommended by sealant manufacturer to preserve the STC rating of the wall system.
   2. At openings and cutouts, fill open spaces between wallboard and fixtures, cabinets, ducts, sleeves, electrical and communications boxes and other flush or penetrating items, with continuous bead of acoustical sealant.
   3. Where sound-rated partition walls intersect non-rated partition walls, extend sound-rated construction to completely close sound flanking paths through non-rated construction. Caulk joints between face layers at vertical interior angles of intersecting partitions...

F. RESILIENT CHANNELS (RC)
   1. Position Resilient Channels at right angles to framing. Space as per manufacturer's recommendations.
   2. On walls:
      a. Install channels with mounting flange down, unless otherwise specified.
      b. Locate channels 2" from floor and within 6" from ceiling.
      c. Cantilever channel ends no more than 6".
      d. Where cabinets are to be installed, attach RC channels to studs at center of top and bottom cabinet hanger brackets. When distance between hangers exceeds 24" o.c. install additional channel at midpoint between hangers.
   3. Attach to studs or joists in the section of web with long slotted cuts, where the manufacturer has pre-drilled holes and not in the section where the web is solid.
   4. Insure that all splices occur between studs. Overlap sections by at least 3" and fasten them together with two screws.
   5. Attach resilient channels to the wall studs with 1" Type S screws or 1-1/4" Type S or Type W screws. Do not use nails.
   6. GWB on RC channel installation:
      a. Mark the location of studs, plates, piping and any other structural member so as to avoid driving drywall supporting screws through those and thus mechanically short-circuit resilient channels. Once gypsum board is attached

to the channels, it should be able to move in-and-out slightly when pushed without scraping any other building element.

b. Attach ½" thick gypsum board to resilient channels using 1" Type S, bugle-head screws spaced 12" o.c. Use 1-1/8" screws for 5/8" GWB. Avoid screw contact with wall studs or any other structural elements. Doing so will short-circuit the resiliency of the channels and markedly increase noise transmission through the wall or floor/ceiling.
c. Hold back GWB which is resiliently supported by RC channels approximately 1/4" from intersecting GWB. Then fill the 1/4" gap with fire-rated, permanently flexible, acoustical caulk as Specified in PART 2 - PRODUCTS.
d. If a second layer of gypsum board is to be attached to the wall, stagger GWB joints by 24" and attach the second layer to RC channels with 1-5/8" Type S, bugle-head screws. Mark location of studs and avoid driving screws into studs. Seal and tape the face layer only.
e. Leave a 1/4" gap around electrical/telephone or any other kind of boxes and GWB. Seal gap with acoustical caulk as Specified in PART 2 - PRODUCTS.

G. ELECTRICAL OUTLET BOXES IN PARTY AND EXTERIOR WALLS
1. Apply acoustical backing pad material as specified in PART 2 – PRODUCTS to seal the outside of the outlet boxes.
2. Leave a ¼" gap in the gypsum wall board around the outlet box. Seal the gap with acoustical, non-hardening caulk such as USG Acoustical Sealant (1-3 hr fire rated) or approved equivalent.
3. If outlet boxes are to be placed on both sides of a party wall assembly, offset the boxes by at least one stud cavity. Back-to-back outlet boxes should never be placed in the same stud cavity.
4. For outlets on drywall which is supported by resilient channels (RC-1) use Aold work@ type boxes, i.e. boxes which are fully supported by the drywall. Avoid contact between box and framing, piping or any other element, with the exception of batt insulation, if any is used and the drywall on which the box is mounted.

H. MECHANICAL EQUIPMENT: All mechanical equipment (fan coil units, fans) shall be isolated from the building structure by means of noise and vibration isolators. No rigid contact shall be allowed between pipes or ducts and building structures or support frames. Submit all isolation systems to acoustical engineer for review.
1. Fan units to be provided with vibration isolator pads to prevent noise transmission through structural elements.
2. Fan Coil Units: Secure to structure thru spring-neoprene hangers (Mason 30N or equal) with 1" static deflection.
3. Ducting (including Z-Ducts) to be lined with min. 1-inch thick duct liner between tenant spaces and/or other adjacent tenant spaces or public spaces. Noise levels to meet the design criteria above for fan noise as measured in the tenant space.
4. System operation to result in no vibration of any elements of building or system which is detectable to persons of normal sensitivity within occupied spaces.
5. There shall be no ventilating or conditioned air ducts located in sound rated assemblies unless specifically detailed and called out.

6. Metal ventilating and conditioned air ducts shall be lined. (exception: ducts serving only exit ways, kitchen cooking facilities, and bathrooms need not be lined.)
7. Sound producing devices such as fans shall not be permitted in sound rated assemblies.
8. Spring-type isolators shall be free-standing and laterally stable without any housing and complete with 1/4" natural rubber or neoprene acoustical friction pads between the base plate and the floor. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. The springs shall be selected for each item of equipment by contractor to provide the specified minimum static deflection. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Spring-type isolators shall be by Mason, Kinetics or Vibrex.
9. Install flexible connectors on dishwashers and HVAC units in a loose, limp manner. The conduit shall make a full 360 degree loop. Install flexible conduit to motors, pumps, roof-top condensers, or machinery in a loose limp manner with a 360 degree loop.
10. Install a 1-1/2" thickness of Manville Insulshield Black on all mechanical equipment closet rooms and FAU closet interior walls
11. Exhaust fans (bathroom and kitchen range hood) shall be low-noise, high quality units. Sound levels for kitchen range hoods shall be not greater than 3.0 sones. Sound levels for bathroom exhaust fans no greater than 2.0 sones.
12. Do not violate separation of double stud walls or partitions with wiring, conduit, bracing or tie bars connecting across the air space. The air space between the separate stud walls shall remain completely free and clear and nothing shall cross it.

I. Electrical Transformers: Isolate the slab-on-grade 1,200 Amp transformer by fastening it on all captive, seismic-rated isolation mounts such as Kinetics RD (www.kineticsnoise.com) or Mason RBS (www.mason-industries.com).

J. Support all bathroom and kitchen exhaust fans from the resiliently-supported ceiling drywall to minimize structure-borne noise to adjacent noise sensitive areas. Do not allow ceiling exhaust fan boxes to make physical contact with floor joists. Fill joist cavities where ceiling exhaust fans are to be located with R-13 fiberglass batts. Caulk all openings in fan boxes with permanently resilient, fire rated acoustical caulk or wrap them with pads from Harry A. Lowry (800) 252-2449, Sound Barrier Insulpads #68 from Dottie Sealants (213) 725-1000 or equal.

K. Flexible Conduit: Provide liquid tight flexible conduit for all final connections to motors and isolated equipment. Flexible conduit between motor or isolated equipment and first anchor to building structure of sufficient length for right angle bend or 8 inch offset with minimum length of 15 inches.

L. If the use of flexible conduits as recommended in 3.01.A is not feasible, then vibration isolate the conduit by inserting collars of isolating liners such as Holdrite #271 (www.holdrite.com) or sleeves made out of 40 durometer rubber or neoprene.

M. All openings for conduits penetrating acoustically-rated partitions must be caulked with a bead of fire-rated acoustical caulk such as: 3M Fire Barrier Sealant CP 25WB+ (www.3M.com), Hilti FS ONE (www.hilti.com), or equal.

N. No rigid connection between vibrating equipment, ductwork, piping, or conduits and building structure shall be made. Coordinate with other trades to avoid rigid contact with the building.

O. Install all isolation equipment accurately and plumb to preclude misalignment or undesired contacts.

P. Install frames of hanger isolators directly against rigid or massive parts of the structure, not to floor/roof/wall diaphragms or lightweight components.

Q. Level vibration isolated equipment under rated design operating conditions. Maintain isolation criteria.

R. Any bracing or supports for mechanical ductwork, piping and equipment shall not bridge or reduce the effectiveness of vibration isolators.

S. Vibration isolation hardware not to be concealed until reviewed by the County's Representative or Acoustical Consultant.

END OF SECTION 09 80 00

WILSON IHRIG
ACOUSTICS, NOISE & VIBRATION
CALIFORNIA
WASHINGTON
NEW YORK

MEMORANDUM – ALAMEDA GSA-IT
ACOUSTICAL ISOLATION FOR PLUMBING SYSTEMS

TO: Klara Komorous
Komorous-Towey Architects

FROM: Pablo Daroux

DATE: 29 November 2016

SUBJECT: **Plumbing Noise Isolation**

Dear Ms. Komorous:
This memo presents general and conceptual recommendations to address potentially excessive noise from plumbing systems for water supply and waste as well as that pertaining to the HVAC system such as coolant lines for fan/coils, condensate, etc.

The goal is for all piping throughout the project, with the exception of fire sprinkler pipes and gas lines, to be vibration isolated. Vent pipes also do not require isolation, apart from supports very near their junctions with waste pipes.

All rigid connections between the supply piping, waste piping, or drains, and the building structure and/or wall and ceiling framing members must be avoided. However, please note that these recommendations are to be implemented at all new construction and at the Bathroom locations identified in Section B of the 8 August 2016 bathroom noise mitigation memorandum.

We recommend the following measures:

1.0 PIPING MATERIAL

a) Plastic piping for waste or drain lines should be avoided. If PVC piping or other plastic pipe is used for waste lines there, then pipe must be fully wrapped with acoustical pipe wrap such as that manufactured by Lowry (see attached cut sheets).

b) Cast iron waste lines should be used where piping is concealed in walls adjacent to all noise-critical areas such as conference rooms, offices, etc.

c) The following recommendations are based on the use of copper piping for supply water lines. Please advise if PEX or CPVC piping is planned for this project.

2.0 PIPE ROUTING

a) Pipes routed within double stud party wall assemblies should only be routed through framing on the side of the room being served and may not be attached to the opposite wall/framing at any point.

b) Schedule 6″ deep studs minimum at walls concealing waste and vent lines.

c) Install 3-1/2″ batt insulation in otherwise un-insulated stud and joist spaces containing supply piping, drain pipes or waste stacks.

3.0 PIPE ISOLATION

a) All supply lines shall be mechanically isolated from the building structure by means of resilient pipe isolators, such as Acousto-Plumb by LSP Specialty Products (www.lspproducts.com) or the Hubbard HoldRite Silencer family of products (www.holdrite.com). Larger piping can be isolated by means of sections of closed neoprene sleeves such as AP/Armaflex (see www.armaflex.com and attached cut sheets). No strap hangers, punched tape or wire should be used to support piping of any kind directly, without the use of one of the isolation systems recommended. Many manufacturers, including LSP Specialty products also make standard plastic isolators as part of other product lines that are NOT designed for noise control and are thus NOT acceptable for this use. Refer to Figure 1, Figure 2 & Figure 3 for schematic details.

b) All new waste lines or those exposed during construction must be isolated, including waste lines suspended from concrete decks.

c) Isolation pads should also be used where piping, pipe connectors, or valves may contact framing, ductwork, structure, studs, gypsum board, or other pipes. Acceptable pads include Holdrite isolation liners #270 and #271, or 1/8″ thick, 40-durometer rubber strips (see attached cut sheets).

d) Metal and strap hangers must be fitted with neoprene isolating material between the strap and pipe, such as Holdrite isolation liners #270 and #271 or 1/8″ thick, 40-durometer rubber collars.

e) Riser clamps for supply and waste lines shall be isolated from the structure using Mason Super W neoprene waffle pads or Holdrite #274 pads, or approved equal under a load bearing metal plate, or with the Hubbard HoldRite Silencer Model #276 isolation system (see attached cut sheets). Refer to Figure 1 and Figure 2 for schematic details.

f) No piping system shall contact another system, electrical conduit, or boxes. Any contact caused by misalignment of piping will require correction.

g) Piping supported by Trapezes can either be isolated individually by means of the isolation clamps indicated in 3.(a) above, or the entire trapeze can be isolated at the supporting rods by means of isolation hangers such as Kinetics FH (www.kineticsnoise.com). See cutsheets below for examples of trapeze isolation schemes.

4.0 PIPE PENETRATIONS

a) Pipes passing through plates, studs, floor joists, etc. shall have holes ½" minimum larger than the pipes' OD (i.e., ¼" minimum clearance all around), making sure that the pipe remains mechanically isolated after construction. Care must be exercised to avoid contact between isolated piping and framing in those places where a resilient insert is not used. Center pipes within the holes at all penetrations. If mechanical contact occurs, then the vibration isolation will be severely compromised.

b) Trades installing wall finishes should keep tiles/wall finishes away from pipe stub outs and penetrations and must caulk gaps with acoustical sealant.

c) There shall be no rigid connections between drain pipes and any areas of wall or ceiling assemblies. The hole for drain pipes shall be oversized and either stuffed with insulation to form a collar, filled with caulk, or the section of pipe wrapped with a sleeve of 40 durometer rubber. Spray foam is not acceptable, as it will harden over time.

d) We recommend using a "red" colored fire rated acoustical caulking to seal pipe penetrations through fire rated walls and floor plates. Acceptable products are

- 3M Fire Barrier Sealant CP 25WB+ www.3M.com
- Hilti FS ONE www.hilti.com ,

or approved equal. See attached cut sheets.

e) Do not use regular gypsum drywall compound to fill gaps between drywall and penetrating pipes. Use only permanently resilient, non hardening, fire rated compounds such as USG Acoustical caulk or the red endothermic acoustical caulks indicated under subsection (d) to fill these gaps. Use sleeves such as Specialty Product's Acousto-Sleeve at all stub-out points where pipes traverse gypsum walls. These sleeves should be fitted temporarily on the pipe to allow the drywall contractor to finish the opening with drywall compound. The sleeve should then be removed and a resilient scutcheon inserted in its place.

5.0 WATER FLOW REQUIREMENTS

a) Limit water pressure to 60 psig at all fixtures.

b) Size supply piping to maintain maximum water-flow rates at 4 feet per second (FPS) in ½-inch to 1-inch diameter, 6 FPS in 1-¼″ to 3″ diameter branch sizes. For pipes 4 inch diameter and larger, maximum allowable flow rate is 8 to 10 FPS.

6.0 PLUMBING FIXTURES

a) Provide low-noise fixtures, which should, ideally, comply with the Group 1 performance as specified in European Standard EN200:1989 for classifying noise generated by single taps and mixer taps.

b) Provide cut sheets for all wall-mount toilets and urinals so that a specific isolation scheme can be recommended.

c) Water hammer arrestors or shock absorbers such as those manufactured by Josam Industries (www.josam.com) or Zurn (www.zurn.com) should be installed at connections

for any water fixture possessing electrically-actuated solenoid valves or other quick shut-off valves, including tank-less toilets. Size as per manufacturer recommendations. Install in an upright position as close as possible to appliance being served, following manufacturer's recommended installation instructions.

7.0 PLUMBING INSTALLATION REVIEW

a) The work should be reviewed during the early phases of the plumbing installation to check if systems installed by other trades have short-circuited the plumbing isolation. Please provide a basic construction schedule, including the plumbing installation schedule, so site reviews can be conducted at appropriate construction milestones.

b) Due to the sensitive nature of plumbing isolation, we recommend contracting with an inspection service to supervise installations. WIA will provide reviews of a representative number of installations and will indicate to the inspector and plumbing subcontractor areas and issues which may contradict the design intent.

Please call if you have any questions on the above, or if you would like any of the attached details in .dwg format.

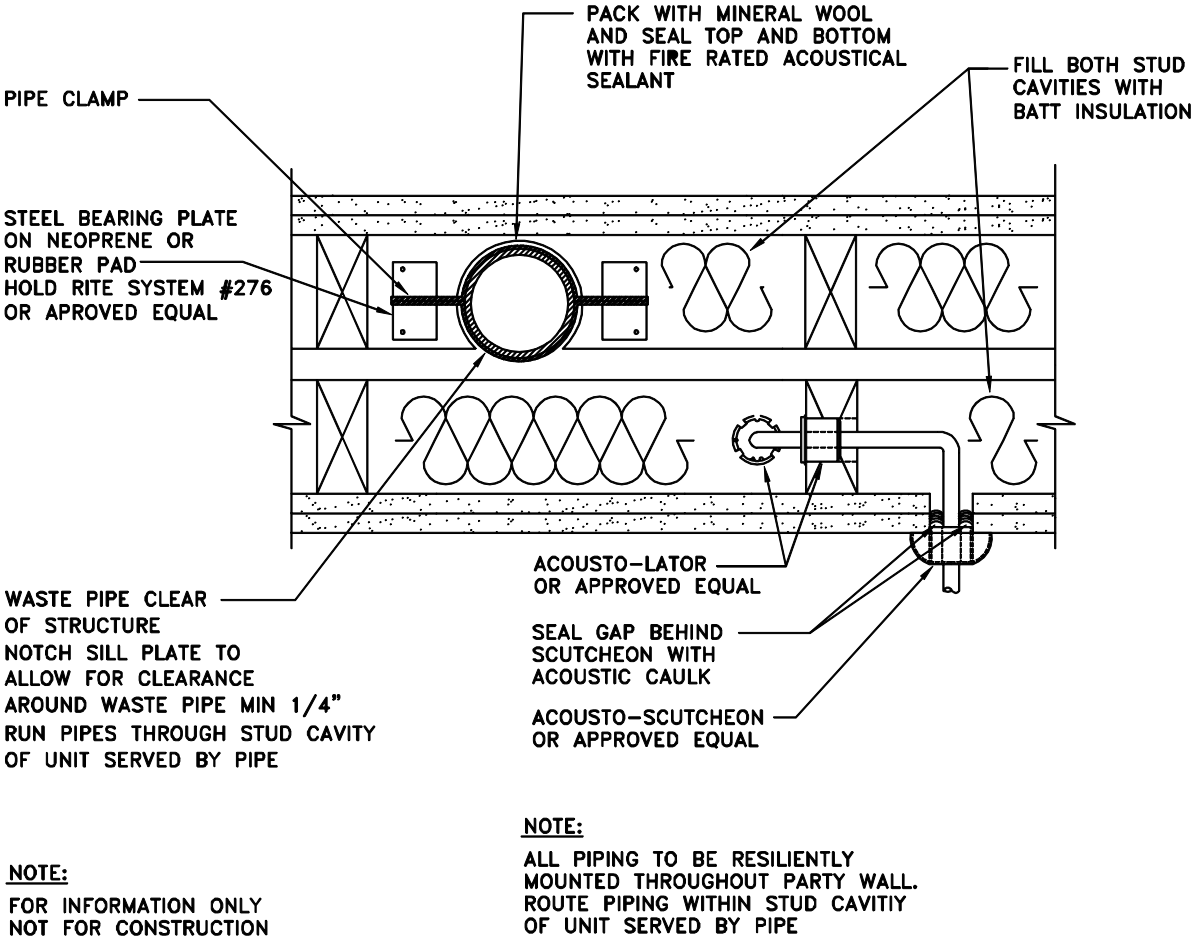


Figure 1: TYPICAL INSTALLATION PLAN DETAIL FOR PIPING AND PIPE SUPPORTS – SCHEMATIC ONLY; NOT FOR CONSTRUCTION. STEEL CONSTRUCTION SIMILAR

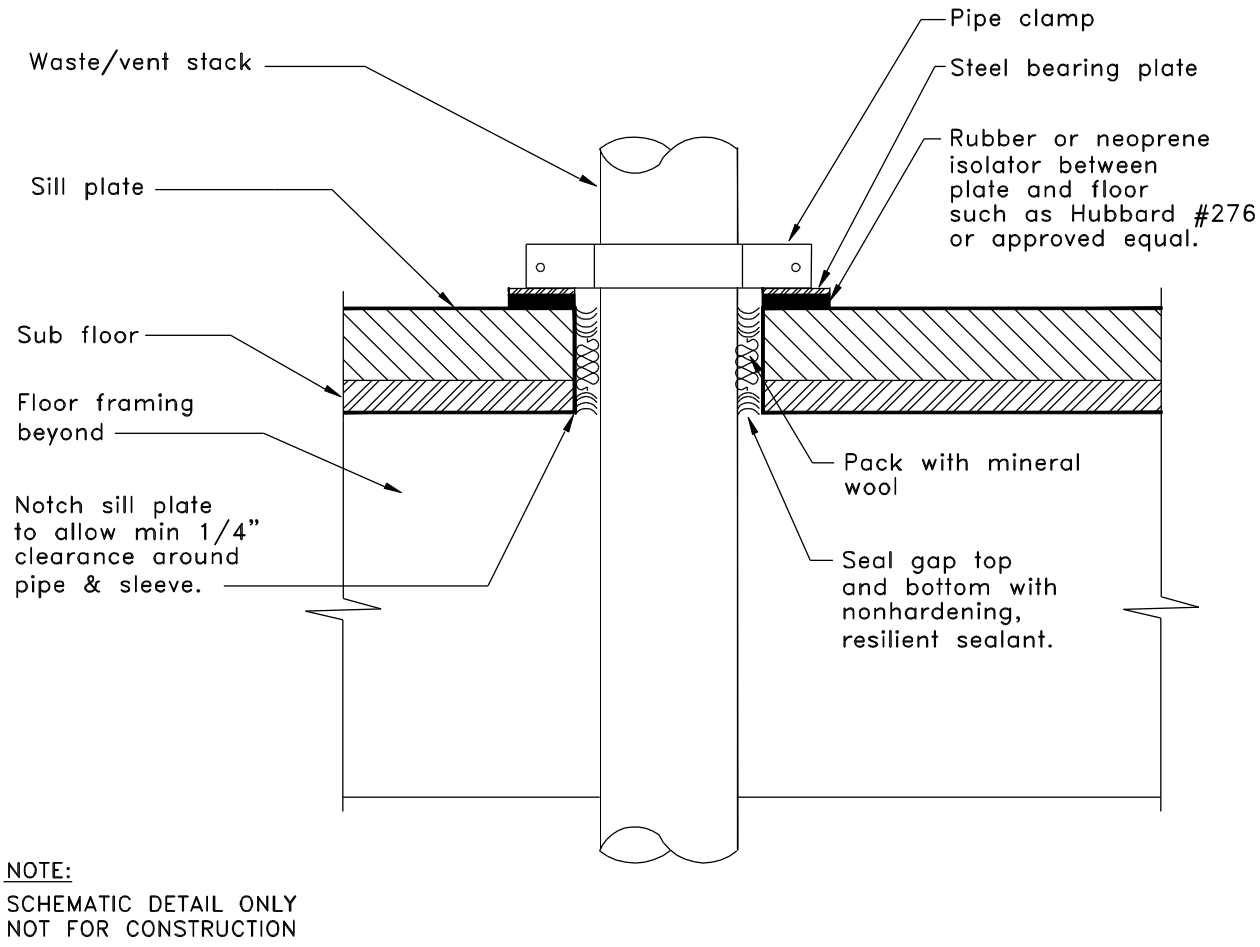


Figure 2: TYPICAL INSTALLATION SECTION DETAIL FOR PIPING AND PIPE SUPPORTS – SCHEMATIC ONLY, NOT FOR CONSTRUCTION. CONCRETE CONSTRUTION SIMILAR

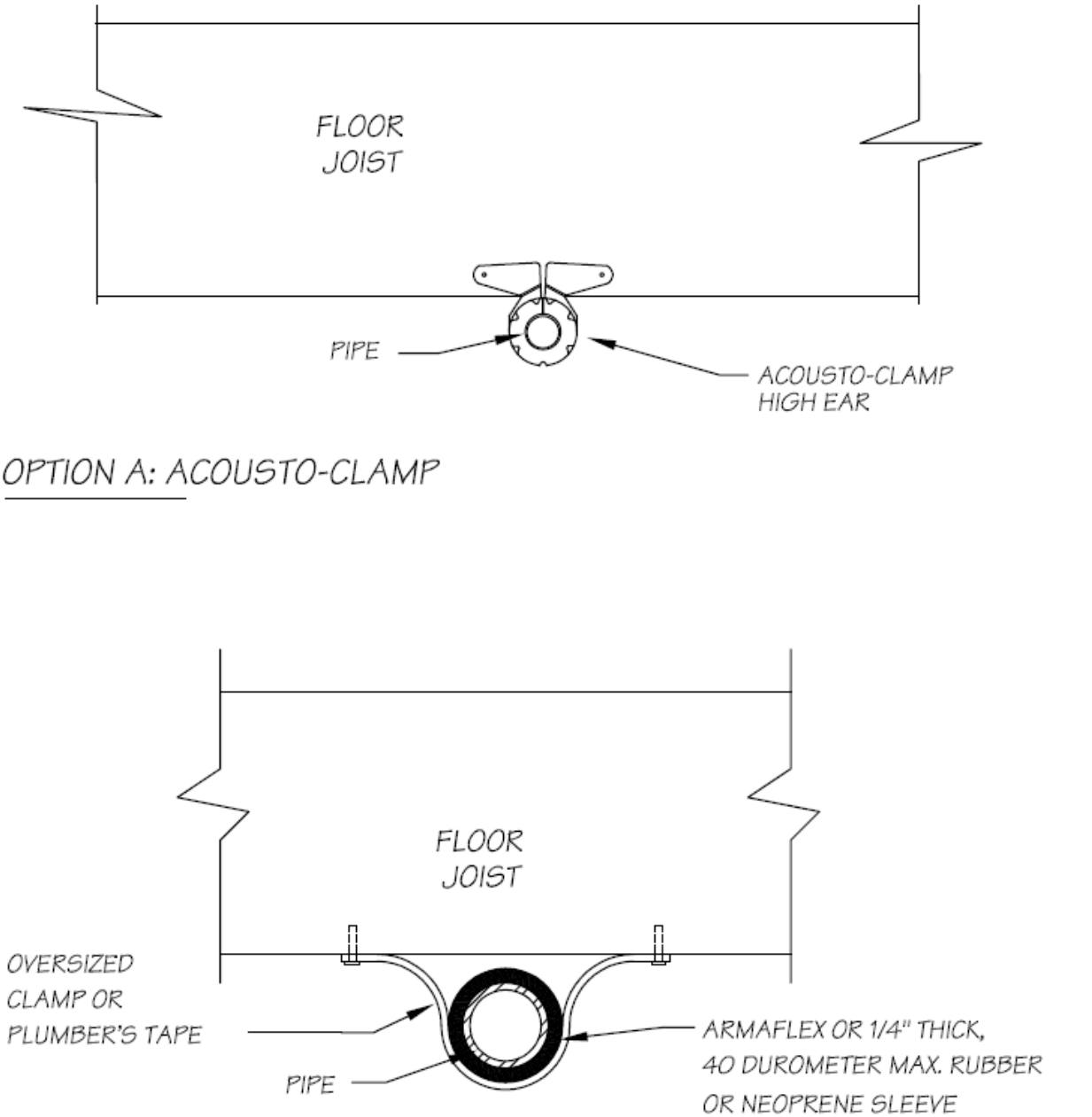


Figure 3: TYPICAL ISOLATION OF PIPES USING RESILIENT SLEEVES OR CLAMPS – SCHEMATIC ONLY, NOT FOR CONSTRUCTION

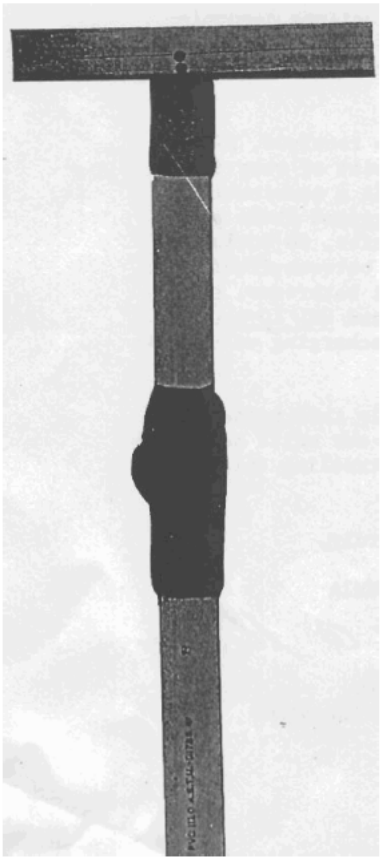
PRODUCT CUT SHEETS

LOWRY'S – WHOLESALE DISTRIBUTORS OF WATERPROOFING

LOS ANGELES - 9243 Cranford Avenue Arleta, CA 91331 Phone: (800) 225-8231 Fax: (818) 768-4130
ORANGE COUNTY - 4770 E. Wesley Drive Anaheim, CA 92807 Phone: (800) 439-4546 Fax: (714) 777-2099
BAY AREA - 2262 Commerce Place Hayward, CA 94545 Phone: (800) 252-2449 Fax: (510) 785-2405
SACRAMENTO - 2641 Port Street West Sacramento, CA 95691 Phone: (866) 270-7333 Fax: (916) 372-7305
SAN DIEGO - ***KIRWAN CO.*** 7377 Convoy Ct. San Diego, CA 92111 Phone: (800) 325-2822 Fax: (858) 268-9662

LOWRY'S ACOUSTICAL PIPE WRAP TAPE

to prevent obnoxious noises in plastic drain/waste water pipe



Composition: Polybutene-butyl rubber and inert fillers. (Positively no asbestos).

Basic Use: Pipe Wrap Tape is a high density mastic that adds mass at critical areas to deaden the splashing noise of drain/waste water cascading through plastic drain/waste water pipe.

Limitations: DO NOT use in areas subjected to temperatures above 200°F.

Packaging: 4 rolls (⅛" x 4" x 30') per case.

Color: Gray only

TECHNICAL DATA

Shelf Life: 1 year

Solids: 100%

Service Temperature: -30° to 200°F

Adhesion: Good to metal and plastics

APPLICATION DATA

Preparation:

A. Brush or wipe construction dust and dirt from the pipe surface

B. If surface is contaminated with oil or grease, lightly wipe with mineral spirits and wipe dry with a clean rag.

Application:

A. After surface preparation is completed, wrap all pipe intersections (i.e., T's, Y's and elbows) with the Lowry's Pipe Wrap Tape. Mold tape completely around junctions and pipe.

B. Wrap should commence starting on pipe outside the Y, T or elbow and proceed completely encapsulating the junction or elbow and covering the pipe joint on the opposite side.

C. Lowry's Pipe Wrap Tape should be used at 2' intervals on straight runs of pipe to dampen sound.

D. Cushion pipe at hangers and where it passes through partition walls with Pipe Wrap Tape.

E. Removal of paper backing is optional.

NOTE: Lowry's Pipe Wrap Tape has been tested and found to have no effect on ABS plastic. Copies of test results are available upon special request.

Availability: Immediately available from Lowry and Associates, Sun Valley, Calif. or most plumbing supply firms in southern California. Call 818/768-4661 or 213/875-0223 for the distributor in your area.

Cost: Cost data is available from Lowry and Associates or your plumbing supply distributor.

Precautions: Wash hands prior to eating. If swallowed call a physician immediately.

WARRANTY

We warrant our products to be free of defects and manufactured to meet published physical properties. We will provide, at no charge, product to replace any product proved to be defective when applied in accordance with our written instructions.

All claims concerning product defects must be made within 12 months of shipment. Absence of such claims in writing during this period will constitute a waiver of all claims with respect of said product.

This warranty is in lieu of any and all other warranties express or implied.

LOWRY 7p Sealants

armacell engineered foams

THE MAKERS OF Armaflex®

SUBMITTAL

AP/Armaflex® TUBES

Description
AP Armaflex Pipe (Tube) Insulation is a flexible elastomeric thermal insulation, black in color, supplied as unslit tubing, in:
- nominal wall thicknesses of 3/8″, 1/2″, 3/4″, 1″ and 1-1/2″ (10, 13, 19, 25 and 38mm)
- popular sizes up to 6″ IPS.

The expanded closed-cell structure of AP Armaflex Pipe Insulation makes it an efficient insulation. It is manufactured without the use of CFC's, HFC's or HCFC's. It is also formaldehyde free, low VOCs, fiber free, dust free and resists mold and mildew.

Factory Mutual Approvals System
AP Armaflex is approved through continuing supervision by Factory Mutual Approvals to consistently provide actual values on these key performance criteria for mechanical system insulation:

Thermal Conductivity: 0.27 BTU-in/hr. ft² °F
Water Vapor Transmission: 0.08 perm-inchFire Rating: will not contribute significantly to fire (simulated end-use testing).

AP Armaflex Pipe Insulation, in thicknesses through 1-1/2″ (38mm) has a flame-spread index of less than 25 and a smoke-developed index of less than 50 as tested by ASTM E 84 and CAN/ULC S-102, "Method of Test for Surface Burning Characteristics of Building Materials," through 1-1/2″† wall thickness.

Note: Numerical flammability ratings alone may not define the performance of products under actual fire conditions. They are provided only for use in the selection of products to meet limits specified.

Uses
AP Armaflex Pipe Insulation is used to retard heat gain and control condensation drip from chilled-water and refrigeration systems. It also efficiently reduces heat flow for hot-water plumbing and liquid-heating and dual-temperature piping. The recommended temperature usage range for AP Armaflex Pipe Insulation is -297°F to +220°F (-183°C to +105°C).

For use on cold pipes, AP Armaflex Pipe Insulation thicknesses have been calculated to control condensation on the insulation outer surface, as shown in the table of thickness recommendations.

AP Armaflex Insulation is acceptable in wall thicknesses through 1-1/2″† for use in air plenums. Conforms to NFPA 90A and NFPA 90B requirements.

AP/Armaflex meets the energy code requirements of ASHRAE 90.1, ASHRAE 90.2, International Energy Conservation Code (IECC) and other building codes.

Resistance To Moisture Vapor Flow
The closed-cell structure of AP Armaflex Insulation prevents moisture from wicking and makes it an efficient insulation. AP Armaflex normally requires no supplemental vapor-retarder protection. Additional vapor-retarder protection may be necessary for AP Armaflex when installed on very-low-temperature piping or where exposed to continually high humidity conditions.

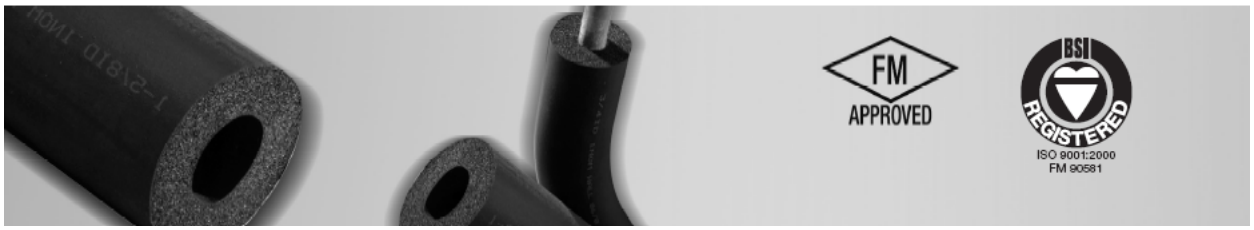
Application
AP Armaflex Pipe Insulation in unslit tubular form can be slipped onto piping before it is connected, or it can be slit lengthwise and snapped over piping already connected. Fitting covers are fabricated from miter-cut tubular form. In all cases, butt joints and seams are to be sealed with Armaflex 520 Adhesive or, where a low V.O.C. adhesive is required, Armaflex 520 BLV Adhesive. 520 Adhesives are contact adhesives; therefore, in all cases, both surfaces to be joined are coated with adhesive.

For pipes greater than 6″ IPS, use AP/Armaflex Sheet/Roll insulation. For thicknesses greater than 1″, sleeve the insulation. See techincal bulletin #030 for additional information. AP/Armaflex pipe insulation is available in 1-1/2″ wall thickness with 25/50 rating for ID size range from 7/8" to 4″ IPS

AP Armaflex is designed for installation above ground. Outdoors, a weather-resistant protective finish is to be applied. WB Armaflex Finish is recommended.

Armaflex insulation products must be installed according to "Installation of Armaflex Insulations" brochure. Proper installation is required to assure Armaflex insulation performance.

Specification Compliance
AP Armaflex Pipe Insulation developed to meet:
ASTM C 534, Type I—Tubular Grade 1
ASTM E 84, NFPA 255, UL 723
CAN/ULC S102
UL 94 5V-A, V-O, File E 55798
NFPA 90A, 90B
UL 181
ASTM G-21/C1338, ASTM G-22
ASTM D 1056, 2B1
MIL-P-15280J, FORM T
MIL-C-3133C (MIL STD 670B), Grade SBE 3
MEA 96-85-M
City of LA - RR 7642



FM APPROVED

BSI REGISTERED
ISO 9001:2000
FM 90581

Physical Data

Physical Properties		Test Method
Thermal conductivity, Btu • in./h • ft² • °F (W/mK)		
75°F mean temp (24°C)	0.27 (0.039)	ASTM C 177
90°F mean temp (32°C)	0.276 (0.040)	or C 518
Water vapor permeability, perm-in. [Kg/(s•m•Pa)]	0.08 (1.16 x 10^{-13})	ASTM E 96 Procedure A
Flame spread and smoke developed index through 1-1/2″ (38mm)	25/50	ASTM E 84 CAN/ULC S102
Mold growth	UL181	Meets requirements
fungi resistance	ASTM G21/C1338	Meets requirements
Bacterial resistance	ASTM G22	Meets requirements
Water absorption, % by volume	0.2	ASTM C 209
Upper use limit ①	220°F (105°C)	—
Lower use limit, °F ②	-297°F (-183°C)*	—
Ozone resistance	GOOD	—
Sizes		
Wall thickness, (nominal)	3/8″, 1/2″, 3/4″, 1″, 1-1/2″ (10, 13, 19, 25 and 38mm)	—
Inside diameter, tubular form	3/8″ ID to 6″ IPS (10mm ID to 168mm) [1-1/2″ Wall: 7/8″ to 4″ IPS (22mm to 114mm)]	—
Length of sections, feet, tubular form	6 (1.8m) [1-1/2" Wall: 3 (0.9m)]	—
Density, typical range ③	3.0 - 6.0 lbs./ft.³	ASTM D 1622 or D 1667

Notes

① On the heating cycle, AP Armaflex Pipe Insulation will withstand temperatures as high as 220°F (105°C). 520 or 520 BLV Adhesive may be used with pipe insulation applications up to 220°F (105°C).

② At -20°F (-29°C), flexible AP Armaflex Insulation becomes hard and, as temperatures drop below -20°F (-29°C), will be increasingly brittle; however, this hardening characteristic does not affect thermal efficiency or water vapor permeability.

* For applications of -40°F to -297°F (-40°C to -183°C), contact Armacell.

③ Reference only.

Performance approved through continuing supervision by Factory Mutual Approvals.

Armaflex Pipe Insulation Thickness Recommendations

For Controlling Outer Insulation Surface Condensation
(Based upon available manufactured thicknesses)

Pipe Size	Line Temperatures			
	50°F (10°C)	35°F (2°C)	0°F (–18°C)	–20°F (–29°C)
BASED ON **NORMAL** DESIGN CONDITIONS*				
3/8″ ID through 1-1/8″ ID (10mm–28mm)	Nom 3/8″ (10mm)	Nom 1/2″ (13mm)	Nom 3/4″ (19mm)	Nom 1″ (25mm)
Over 1-1/8″ ID through 2-1/8″ ID (28mm–54mm)	Nom 3/8″ (10mm)	Nom 1/2″ (13mm)	Nom 1″ (25mm)	Nom 1″ (25mm)
Over 2-1/8″ ID through 2-5/8″ ID (54mm–65mm)	Nom 3/8″ (10mm)	Nom 1/2″ (13mm)	Nom 1″ (25mm)	Nom 1-1/4″ (32mm)
Over 2-5/8″ ID through 6″ IPS (65mm–168mm)	Nom 1/2″ (13mm)	Nom 3/4″ (19mm)	Nom 1″ (25mm)	Nom 1-1/4″ (32mm)
BASED ON **MILD** DESIGN CONDITIONS**				
3/8″ ID through 2-5/8″ ID (10mm–65mm)	Nom 3/8″ (10mm)	Nom 3/8″ (10mm)	Nom 1/2″ (13mm)	Nom 3/4″ (19mm)
Over 2-5/8″ ID through 6″ IPS (65mm–168mm)	Nom 1/2″ (13mm)	Nom 1/2″ (13mm)	Nom 1/2″ (13mm)	Nom 3/4″ (19mm)
BASED ON **SEVERE** DESIGN CONDITIONS***				
3/8″ ID through 1-5/8″ ID (10mm–40mm)	Nom 3/4″ (19mm)	Nom 1″ (25mm)	Nom 1-1/2″ (38mm)	Nom 1-1/2″ (38mm)
Over 1-5/8″ ID through 3-5/8″ ID (40mm–90mm)	Nom 3/4″ (19mm)	Nom 1″ (25mm)	Nom 1-1/2″ (38mm)	Nom 1-3/4″ (44mm)
Over 3-5/8″ ID through 6″ IPS (90mm–168mm)	Nom 3/4″ (19mm)	Nom 1″ (25mm)	Nom 1-1/2″ (38mm)	Nom 2″ (50mm)

NOTE: Thicknesses greater than 1″ (25mm) are multiple-layer applications, see technical bulletin #30.

*BASED ON **NORMAL** DESIGN CONDITIONS AP Armaflex in the thicknesses noted and within the specified temperature ranges will control outer insulation surface condensation indoors under **normal** design conditions, a maximum severity of **85°F (29°C) and 70% RH.** Armacell research and field experience indicate that indoor conditions anywhere in the United States seldom exceed this degree of severity.

BASED ON **MILD DESIGN CONDITIONS AP Armaflex in the thicknesses noted and within the specified temperature ranges will control outer insulation surface condensation indoors under **mild** design conditions, a maximum severity of **80°F (27°C) and 50% RH.** Typical of these conditions are most air-conditioned spaces and arid climates.

***BASED ON **SEVERE** DESIGN CONDITIONS AP Armaflex in the thicknesses noted and within the specified temperature ranges will control outer insulation surface condensation indoors under **severe** design conditions, a maximum severity of **90°F (32°C) and 80% RH.** Typical of these conditions are indoor areas in which excessive moisture is introduced or in poorly ventilated confined areas where the temperature may be depressed below ambient.

†1-1/2" thickness available with 25/50 rating.

armacell
engineered foams

ARMACELL LLC
7600 Oakwood Street Extension
P. O. Box 1038, Mebane, NC 27302

TEL. 919 304-3846 • FAX 919 304-3847
E-MAIL info.us@armacell.com
INTERNET www.armacell.com

For any updates on this document, please refer to our website.

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017S	001	01	06	NA	NA

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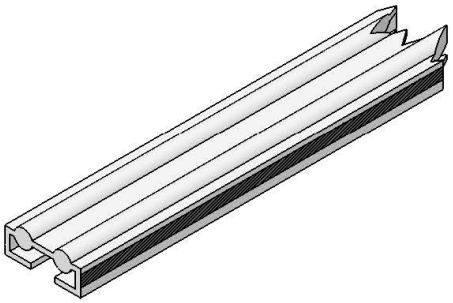
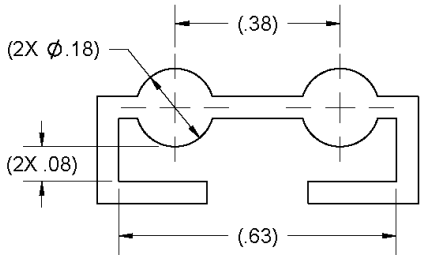
Printed in United States of America

PRODUCT SPECIFICATION DRAWING
HOLDRITE® #270 Acoustical Isolation Liner





ALL DIMENSIONS IN INCHES

Engineered sound insulation lining, minimizes the occurrence of frictional noises caused by thermal expansion of the pipes and protects against contact between dissimilar materials. Attaches to ends of Holdrite® Stout Brackets or around pipes to provide isolation from structure. Also provide sound isolation between metal loop hangers and piping. Available in 50' rolls.

Product Information:

- Material: Dammgulast®, 45 Shore A, black, with orange identification stripes
- Temperature Range: -30°F to 180°F
- Sound isolation up to 18db(A)
- UV resistant

Product Submittal	
Job Name:	
Date:	
Part Number:	Qty:
Architect / Owner:	
Contractor:	
Notes:	

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HOLDRITE®

"Converting Makeshift Plumbing Methods into Engineered Solutions"

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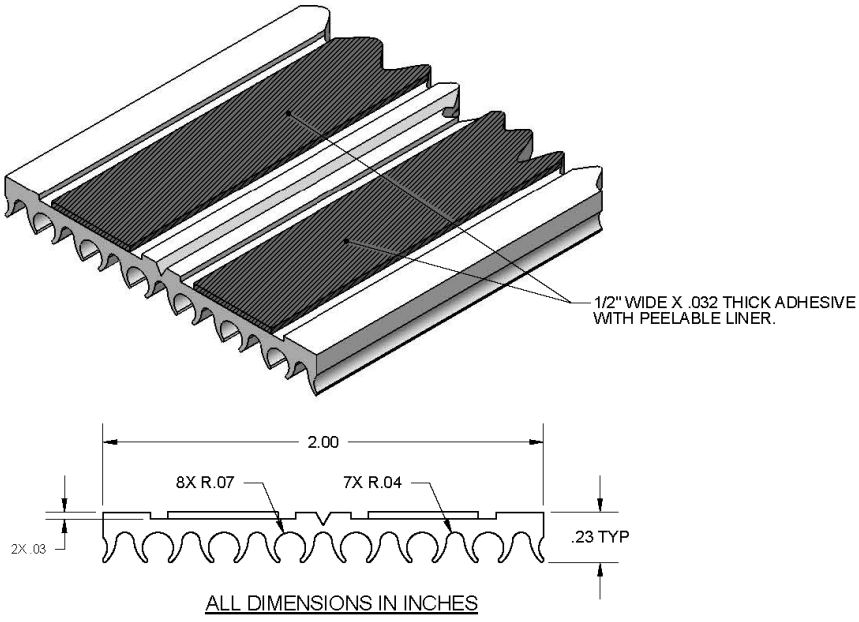
PRODUCT SPECIFICATION DRAWING
HOLDRITE® Silencer™ #271 Self-Adhesive Acoustical Insulation Liner



The HOLDRITE® Silencer™ #271 is an engineered sound isolation lining with many versatile applications for use in minimizing noise transfer with plumbing and piping systems. This 2" wide strip comes in 25' rolls and can easily be cut down the center at 1" width. The self adhesive strips provide grip to piping or hangers. Excellent for use in isolating against sound or dissimilar metal contact in hangers or through framing components.

Product Information:

- Material: TPE, Natural (off-white), 35 Shore A
- Temperature Range: -20°F to +180°F continuous services

Product Submittal	
Job Name:	
Date:	
Part Number:	Qty:
Architect / Owner:	
Contractor:	
Notes:	

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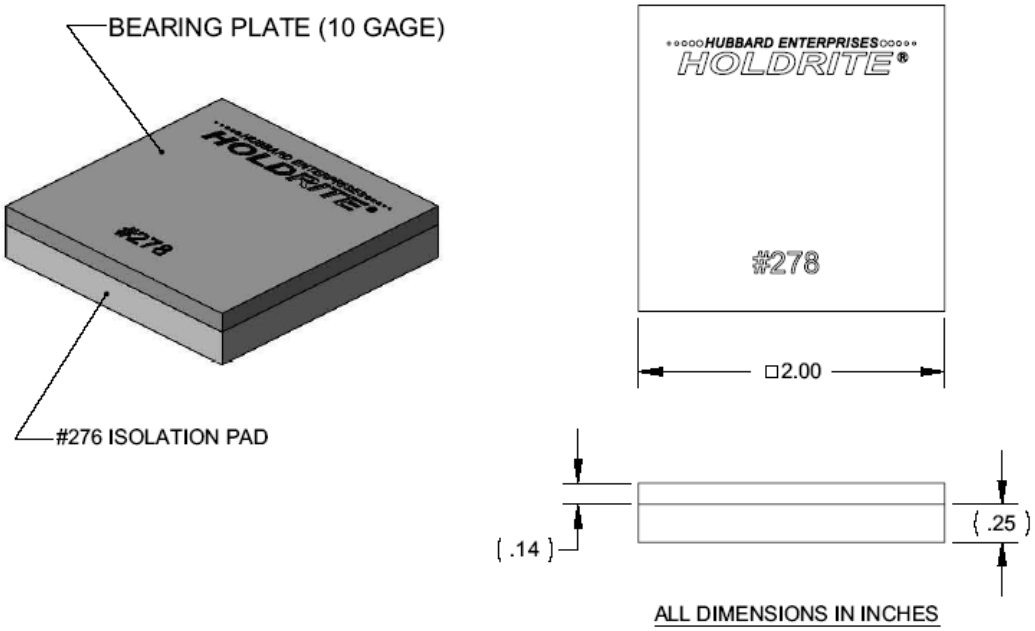
PRODUCT SPECIFICATION DRAWING
HOLDRITE® Silencer™ #278 Isolation Pad



ALL DIMENSIONS IN INCHES

The HOLDRITE® Silencer™ #278 is an engineered sound and vibration isolation pad with a steel bearing plate. Ideal for use in isolating riser clamps and equipment bases from noise transfer to the structure.

Product Information:

- Material:
  Bearing Plate: 10 gage, CRS
  Isolating Pad: Neoprene, 50 shore A, black

ACOUSTICAL ISOLATION SEAL OF APPROVAL
ISO-3822 Certified Lab
1/3 Octave band testing

Product Submittal	
Job Name:	
Date:	
Part Number:	Qty:
Architect / Owner:	
Contractor:	
Notes:	

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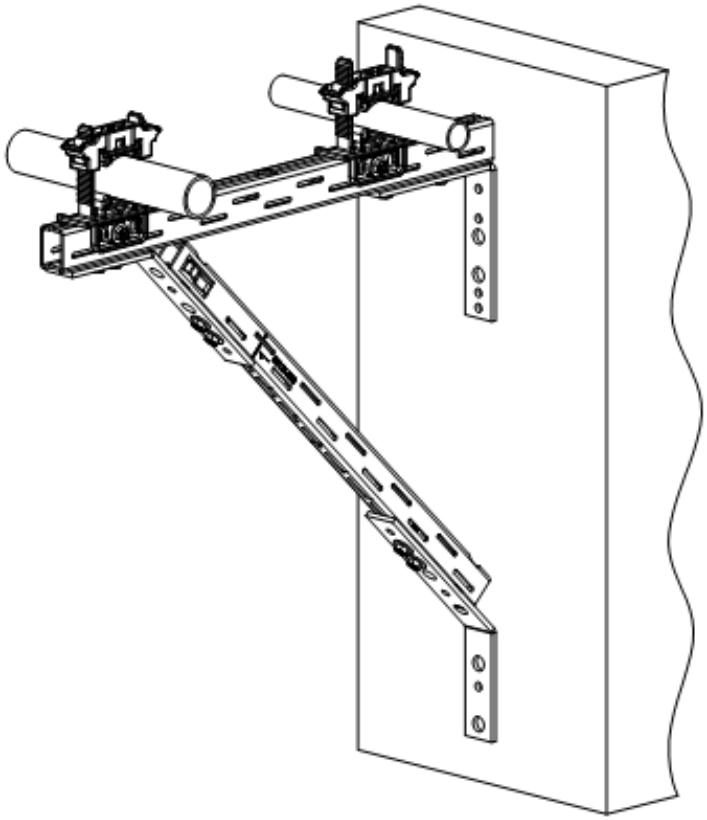

HORIZONTAL PIPING

HOLDRITE® EZK "STAND-OFF" BRACKET.
SHOWN WITH #250 STOUT CLAMPS™.

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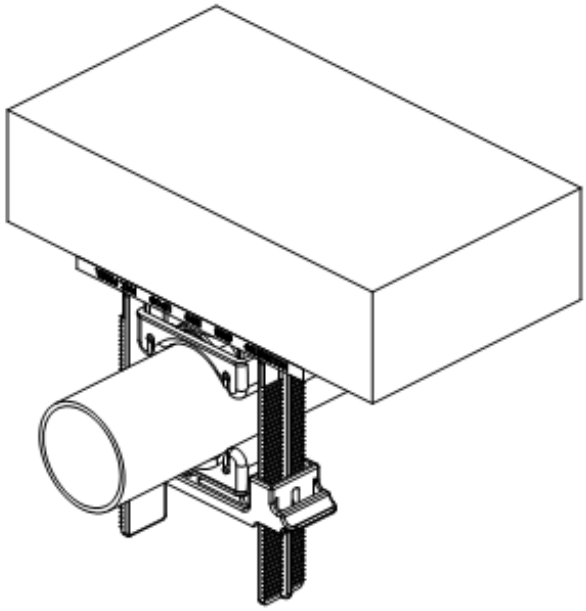
HOLDRITE®

CONVERTING MAKESHIFT METHODS INTO ENGINEERED SOLUTIONS℠

800-321-0316 OR 760-744-6944 / FAX: 760-744-0507 / WWW.HOLDRITE.COM / 50-005021-100, RevE (Horizontal Piping with #EZK & #250)



SUSPENDED PIPING

SHOWN WITH HOLDRITE® #285 STANDARD CLAMP WITH ACOUSTICAL PADS WITH A 1-½" TUBE MOUNTED TO A FRAMING MEMBER. THIS CLAMP ACCEPTS 1" THROUGH 2" TUBING. (#285-S CLAMP AVAILABLE FOR 25/50 PLENUM RATED APPLICATIONS)

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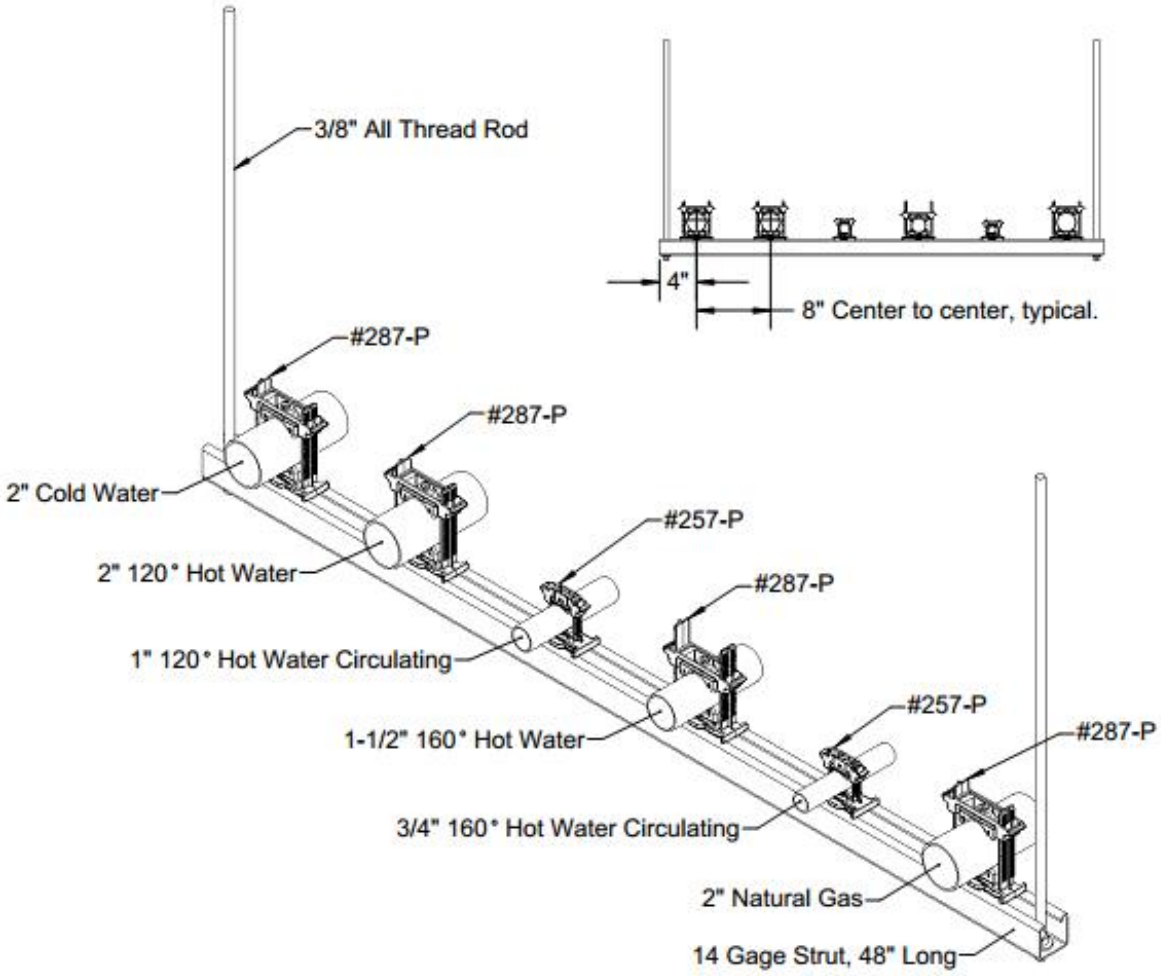
HOLDRITE®

CONVERTING MAKESHIFT METHODS INTO ENGINEERED SOLUTIONS℠

800-321-0316 OR 760-744-6944 / FAX: 760-744-0507 / WWW.HOLDRITE.COM / 50-005024-100, RevF (Suspended Piping with #285)



OVERHEAD TRAPEZE PIPING

SHOWN WITH HOLDRITE® STRUT CLAMPS
MOUNTED TO STANDARD STRUT PLATFORM
(#257-P HOLDS 3/8"-1" CTS, #287-P HOLDS 1"-2" CTS/IPS)
(#257-S & #287-S CLAMPS AVAILABLE FOR 25/50 PLENUM RATED APPLICATIONS)

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HOLDRITE®

CONVERTING MAKESHIFT METHODS INTO ENGINEERED SOLUTIONS℠

800-321-0316 OR 760-744-6944 / FAX: 760-744-0507 / WWW.HOLDRITE.COM / 50-005269-100, RevD (Overhead Trapeze Piping with #257-P & #287-P)

KINETICS™
Isolation Hangers
Model FH

Description
Kinetics Model FH hangers are recommended for use in isolating high frequency noise produced by suspended equipment, piping, and ductwork. Model FH Hangers incorporate a coded, molded, inorganic fiberglass isolation pad attached to a steel load transfer plate and to a stamped or welded hanger bracket. Hangers will allow a support rod misalignment through a 30° arc. Isolation brackets will carry 500% overload without failure. Fiberglass pads are fine (0.00027" diameter/6.8 microns) bonded annealed glass fibers which are stabilized by severely overloading the material during the manufacturing process, and then coated with a flexible moisture-impervious elastomeric membrane. Fiberglass is unique in that the natural frequency is constant over a wide operating load range, and the stiffness increases proportionately with load applied. Model FH Isolation Hangers are available in sizes with capacities from 250 to 900 lbs. (113 to 408 kg), with deflection of 0.18" to 0.27" (5 to 7 mm). Kinetics Model FH hangers are recommended for the isolation of vibration produced by suspended mechanical or electrical equipment, in-line and exhaust fans, ductwork, piping, etc.

Application
Kinetics Model FH hangers are recommended for use in isolating any suspended source of audible frequency vibration, or noise, located near a critically quiet area.

Isolation of noise in piping and ductwork systems from a building structure is a typical use of Model FH hangers. Piping within 100 pipe diameters of connection to mechanical equipment should be isolated with Model SFH spring and fiberglass hangers to control transmission of low frequency vibration as well as noise.

High sound transmission loss ceiling systems can be effectively isolated by Model FH hangers. When isolating sources of predominately low frequency noise such as flyover aircraft, Model SFH hangers are recommended.

Model FH hangers are shipped fully assembled and ready for installation in threaded rod suspension systems.

Hanger Type	Rated Load		Deflection		L		W		A		Dmax		H	
	lbs	kg	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
FH-250A	250	113	0.27	7	5.91	150	3.15	80	2.25	57	0.63	16	1.13	29
FH-500A	500	227	0.18	5	5.91	150	3.15	80	2.25	57	0.63	16	1.13	29
FH-900A	900	408	0.27	7	8.00	203	4.00	102	4.75	121	0.75	19	1.63	41

Specifications

Vibration isolators with maximum static deflection requirements under the operating load conditions not exceeding 0.27" (7 mm) shall be hangers consisting of a precompressed molded fiberglass insert, complete with load transfer plate and assembled in a stamped or welded steel bracket.

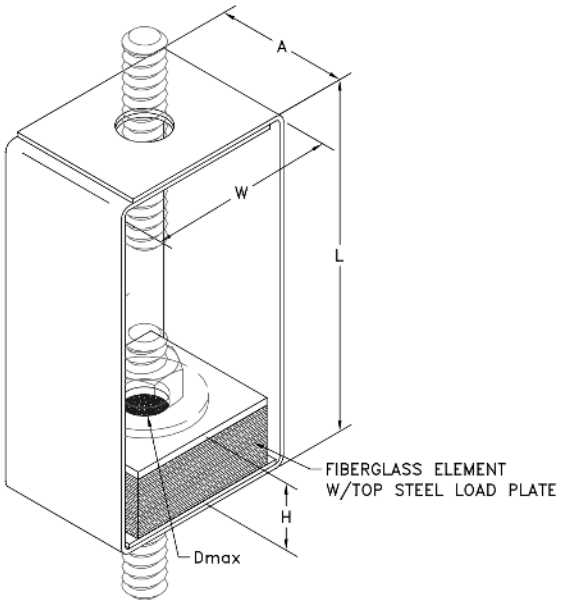
The fiberglass insert shall be individually coated with a flexible, moisture-impervious elastomeric membrane. The insert shall be molded from glass fibers with fiber diameters not exceeding 0.00027" (6.8 microns) and with a modulus of elasticity of 10.5 million PSI (738,223 kg/cm^2).

Natural frequency of fiberglass vibration isolators shall be essentially constant for the operating load range of the supported equipment. Vibration isolators shall be coded to indicate load capacity.

The hanger bracket shall be designed to carry a 500% overload without failure and to allow a support rod misalignment through a 30° arc without metal-to-metal contact or other short circuit.

Isolation hangers shall be selected by the manufacturer for each specific application to comply with deflection requirements as shown on the Vibration Isolation Schedule or as indicated on the project documents.

Vibration isolation assembly shall be Model FH, as manufactured by Kinetics Noise Control, Inc.



KINETICS Noise Control

United States
6300 Irelan Place
P.O. Box 655
Dublin, Ohio 43017
Phone: 614-889-0480
Fax: 614-889-0540

Canada
3570 Nashua Drive
Mississauga, Ontario
L4V 1L2
Phone: 905-670-4922
Fax: 905-670-1698

www.kineticsnoise.com
sales@kineticsnoise.com

Kinetics Noise Control, Inc. is continually upgrading the quality of our products. We reserve the right to make changes to this and all products without notice.

FS-ONE

Technical Data

At 73°F (23°C) and 50% relative humidity

Chemical basis
Water-based intumescent acrylic dispersion

Density
Approx. 1.5 g/cm³

Color
Red

Working time
Approx. 20-30 min.

Curing time
Approx. 14-21 days

Shore A Hardness
Approx. 35

Movement capability
Approx. 5%

Intumescent Activation
Approx 250°F (121°C)
Expansion rate (unrestricted):
Up to 3-5 times original volume

Temperature resistance (cured)
–40°F to 212°F (–40°C to 100°C)

Application temperature
35°F to 100°F (2°C to 38°C)

Surface burning characteristics (ASTM E 84-96)
Flame Spread: 0
Smoke Development: 5

Sound transmission classification
ASTM E 90-97: 56

Approvals

ICBO Evaluation Service, Inc.
Report No. 5071

California State Fire Marshal
Listing No. 4485-1200:108

City of New York
MEA 326-96-M Vol. IV

Tested in accordance with
- UL 1479
- ASTM E 814
- ASTM E 84

Internationally tested and approved

FILL, VOID OR CAVITY MATERIAL
FOR USE IN THROUGH-PENETRATION
FIRESTOP SYSTEMS
SEE UL FIRE RESISTANCE DIRECTORY
68Y7

FM APPROVED

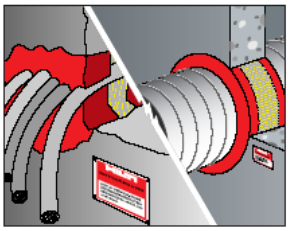
FCG =BM= SYSTEM COMPATIBLE

latest product information : www.us.hilti.com

ordering information see page: 30

FS-ONE

High Performance Intumescent Firestop Sealant



System Advantage / Customer Benefits
- Protects most typical firestop penetration applications
- Easy to work with and fast cleanup
- Can be repenetrated when laying new cables
- Can be painted

Product description
- Intumescent (expands when exposed to fire) firestop sealant that helps protect combustible and non-combustible penetrations for up to 4 hours fire rating

Product features
- Smoke, gas and water resistant
- Contains no halogen, solvents or asbestos
- High fire rating properties
- Water based, easy to clean

Areas of application
- Steel, copper and EMT pipes
- Insulated steel and copper pipes
- Cable bundles
- Closed or vented plastic pipes
- HVAC penetrations

For use with
- Concrete, masonry, drywall and wood floor assemblies
- Wall and floor assemblies rated up to 4 hours

Examples
- Sealing around plastic pipe penetrations in fire rated construction
- Sealing around combustible and non-combustible penetrations in fire rated construction

Installation instructions for FS-ONE

Opening

1. Clean the opening. Surfaces to which FS-ONE will be applied should be cleaned of loose debris, dirt, oil, moisture, frost and wax. Structures supporting penetrating items must be installed in compliance with local building and electrical standards.

Application of firestop sealant

2. Install the prescribed backfilling material type and depth to obtain the desired rating (if required). Leave sufficient depth for applying FS-ONE.
3. Application of firestop sealant: Apply FS-ONE to the required depth in order to obtain the desired fire rating. Make sure FS-ONE contacts all surfaces to provide maximum adhesion. For application of FS-ONE use a standard caulking gun, foil pack gun, bulk loader and bulk gun. With FS-ONE buckets, Graco type sealant pumps may be used. (Contact pump manufacturer for proper selection).
4. Smoothing of firestop sealant: To complete the seal, tool immediately to give a smooth appearance. Excess sealant, prior to curing, can be cleaned away from adjacent surfaces and tools with water.
5. Leave completed seal undisturbed for 48 hours.
6. For maintenance reasons, a penetration seal could be permanently marked with an identification plate. In such a case, mark the identification plate and fasten it in a visible position next to the seal.

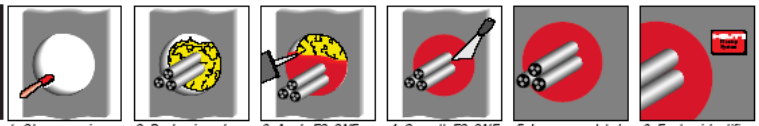
Notice about approvals
- Check that the penetration has been sealed according to the specified drawing in the UL Fire Resistance Directory or Hilti Firestop Manual. For further advice, please contact Hilti customer service. Refer to Hilti product literature and UL fire resistance directory for specific application details.

Not for use...
- High movement expansion joints
- Underwater
- On materials where oil, plasticizers or solvents may bleed i.e. impregnated wood, oil based seals, green or partially vulcanized rubber
- In any penetration other than those specifically described in this manual or the test reports

Safety precautions
- Before handling, read the product and Material Safety Data Sheet for detailed use and health information
- Keep out of reach of children
- Wear suitable gloves and eye protection

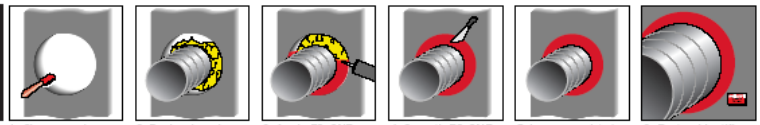
Storage
- Store only in the original packaging in a location protected from moisture at temperatures between 40°F (5°C) and 86°F (30°C)
- Observe expiration date on the packaging

CABLE



1. Clean opening. 2. Pack mineral wool. (If required) 3. Apply FS-ONE. 4. Smooth FS-ONE. 5. Leave completed seal undisturbed for 48 hours. 6. Fasten identification plate (if required).

PIPE



1. Clean opening. 2. Pack mineral wool. (If required) 3. Apply FS-ONE. 4. Smooth FS-ONE. 5. Leave completed seal undisturbed for 48 hours. 6. Fasten identification plate (if required).

WILSON IHRIG & ASSOCIATES
ACOUSTICAL AND VIBRATION CONSULTANTS

CALIFORNIA NEW YORK WASHINGTON

6001 SHELLMOUND STREET
SUITE 400
EMERYVILLE, CA 94608
Tel: 510-658-6719
Fax: 510-652-4441
www.wiai.com

MEMORANDUM – ALAMEDA GSA-IT
ACOUSTICAL ISOLATION FOR ELECTRICAL SYSTEMS

TO: Klara Koumorous
Komorous-Towey Architects

FROM: Pablo Daroux

DATE: 29 November 2016

SUBJECT: **Electrical Noise Isolation Guidelines**

Dear Ms. Komorous:
This memo presents general and conceptual recommendations to address potentially excessive noise from electrical systems. These recommendations should be implemented at all new construction and at the bathroom walls for the present construction, per the recommendations provided in our bathroom noise mitigation memorandum dated 8 August 2016.

We recommend the following measures:

1.0 ELECTRICAL BOXES

a) Apply acoustical backing pad material to seal the outside faces of the back and sides of electrical, communications, or other similar type outlet boxes at all acoustically-rated partitions. Acceptable products or approved equivalent:
   a. Nelson Fire Rated FSP Putty Pads manufactured by EGS Electrical
      www.nelsonfirestop.com
   b. BioStop Fire Rated Putty Pads
      www.biofireshield.com
   c. SpecSeal Putty Pads
      www.stifirestop.com
   d. IsoBacker Outlet Backer Pad by Kinetics Noise Control
      www.kineticsnoise.com

b) Leave a ¼" gap around the outlet box and the wall gypsum board. Seal the gap with acoustical, non-hardening caulk such as USG Acoustical Sealant (1-3 hr fire rated) or approved equivalent.

c) If outlet boxes are to be placed on both sides of a wall assembly, offset the boxes by at least one stud cavity, if possible.

d) For outlets on drywall which is supported by resilient channels or resilient isolation clips use "old work" type boxes, i.e. boxes which are fully supported by the drywall. Avoid contact between box and framing, piping or any other element, with the exception of batt insulation, if any is used, and the drywall on which the box is mounted.

2.0 ELECTRICAL CONDUITS

a) Conduits feeding vibration mechanical equipment such as pumps, fans, fan/coils, motors, etc. should be of the flexible type. Provide a section of flex conduit sufficiently long to be able to create a 360 loop between the vibrating equipment and any rigid connection to the building structure.

b) If the use of flexible conduits as recommended in 2.(a) is not feasible, then vibration isolate the conduit by inserting collars of isolating liners such as Holdrite #271 (www.holdrite.com) or sleeves made out of 40 durometer rubber or neoprene.

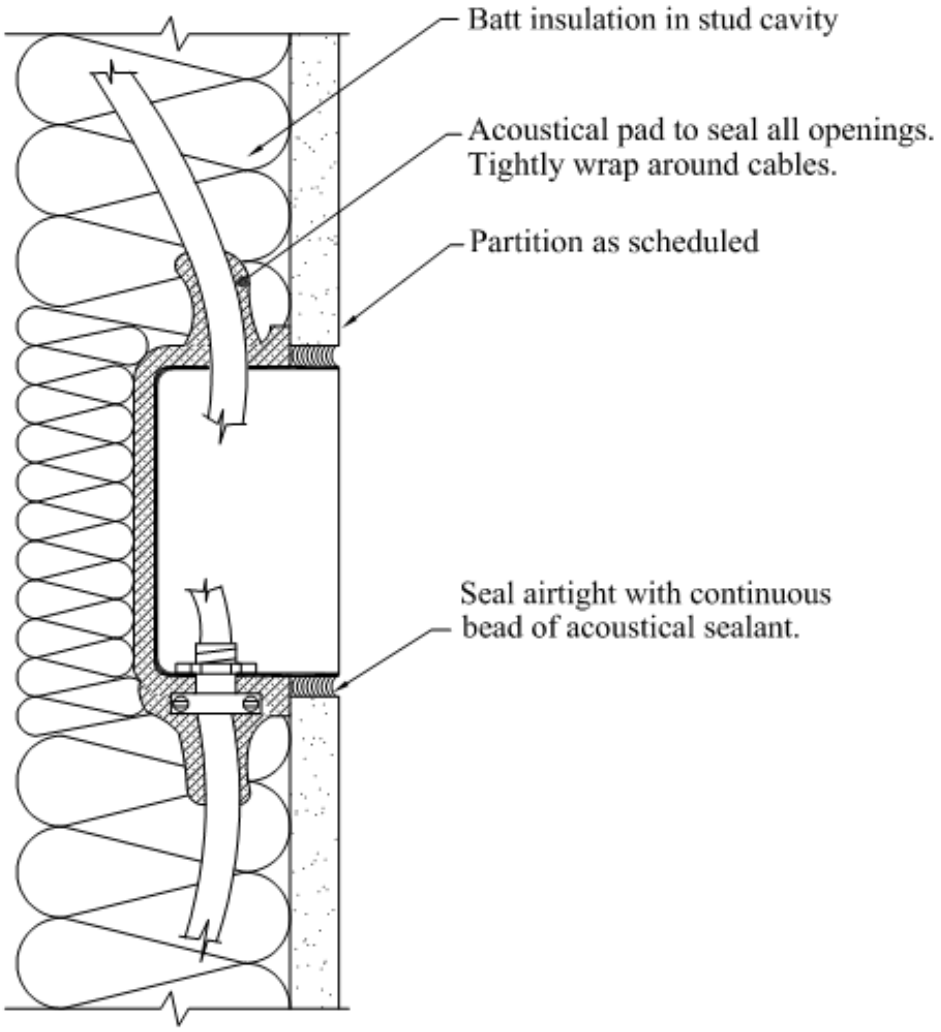
c) All openings for conduits penetrating acoustically-rated partitions must be caulked with a bead of fire-rated acoustical caulk such as:

- 3M Fire Barrier Sealant CP 25WB+ (www.3M.com)
- Hilti FS ONE (www.hilti.com)

or approved equal. See attached cut sheets.

3.0 ELECTRICAL TRANSFORMERS

Several large transformers will be installed in the basement and upper floors. In order to isolate these devices, we recommend fastening them with all captive, seismic-rated isolation mounts such as Kinetics RD (www.kineticsnoise.com) or Mason RBS (www.mason-industries.com). See cut sheets of those products below.



NOTES

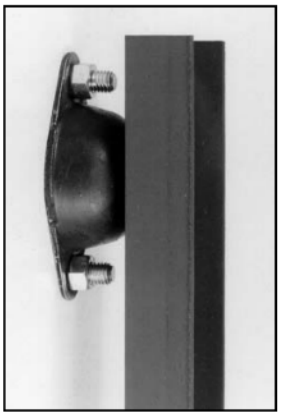
1. Electrical boxes on opposite sides of partitions should not share the same stud cavity. Keep a minimum of 24" between junction boxes.

2. Use fire rated putty pads such as:
   - FSP by Nelson Firestop (www.nelsonfirestop.com)
   - SpecSeal Putty Pads (www.stifirestop.com)
   - Dottie #68 (www.lhdottie.com)
   - Biostop (www.biofireshield.com)

Figure 1: TYPICAL ACOUSTICAL ISOLATION OF ELECTRICAL BOXES

PRODUCT CUT SHEETS

KINETICS™
Elastomeric Isolators
Model RQ



Description

Kinetics Model RQ Vibration Isolators are one-piece molded neoprene mounts with encapsulated metal inserts. The metal inserts provide all-directional resistance for horizontally and vertically applied loads. Each isolator incorporates two bolt-down holes on the bottom load surface and a steel top load plate for attachment to the supported equipment. The neoprene is highly oil resistant and has been designed to operate within the strain limits of the isolator to provide the maximum isolation and longest life expectancy possible using neoprene compounds. Model RQ is designed for up to 0.13" (3 mm) deflection, available in three sizes and thirteen capacities from 210 lbs. to 1950 lbs. (95 kg to 885 kg). Kinetics Model RQ is recommended for the isolation of vibration produced by small pumps, vent sets, low pressure packaged air-handling units, etc., and is usually selected when first cost must be minimized.

Application

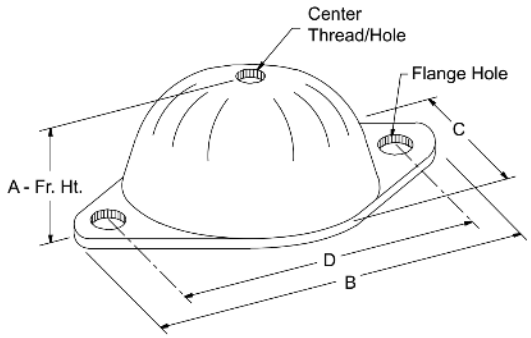
Kinetics Model RQ neoprene isolation mounts can be used to isolate high frequency vibration generated by mechanical equipment located on a grade-supported structural slab, pier or load-bearing wall.

Typical applications of Model RQ neoprene isolators are limited to isolation of mechanical equipment having lowest operating speeds of 1750 RPM when located on a grade-supported slab, pier or load bearing wall, and include close coupled pumps with motors of 5 H.P. or less, small vent sets, low pressure packaged air-handling units, wall-mounted electrical transformers and similar equipment types.

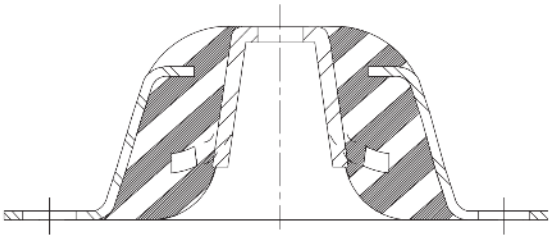
Model RQ neoprene isolation mounts can be used for isolation of mechanical equipment specified to be supported by neoprene rubber or elastomer isolators and with tabulated minimum static deflections up to 0.13" (3 mm).

Model RQ neoprene isolation mounts are also selected for use in seismic and windload restraint applications.

Isolator Type	Durometer	Rated Capacity lbs (kg)	Rated Deflection in (mm)	A in (mm)	B in (mm)	C in (mm)	D in (mm)	Center NC Thread in (mm)	Center Hole Dia. in (mm)	Flange Hole Dia. in (mm)
RQ-210 A	30A	210 (95)	0.10 (3)	1.12 (28)	3.75 (95)	2.27 (58)	3.00 (76)	0.38 (10)	-	0.34 (9)
RQ-370 A	40A	370 (168)	0.10 (3)	1.12 (28)	3.75 (95)	2.27 (58)	3.00 (76)	0.38 (10)	-	0.34 (9)
RQ-520 A	50A	520 (236)	0.10 (3)	1.12 (28)	3.75 (95)	2.27 (58)	3.00 (76)	0.38 (10)	-	0.34 (9)
RQ-680 A	60A	680 (308)	0.10 (3)	1.12 (28)	3.75 (95)	2.27 (58)	3.00 (76)	0.38 (10)	-	0.34 (9)
RQ-750 A	70A	750 (340)	0.08 (2)	1.12 (28)	3.75 (95)	2.27 (58)	3.00 (76)	0.38 (10)	-	0.34 (9)
RQ-375 B	40A	375 (170)	0.13 (3)	1.66 (42)	5.38 (137)	3.25 (83)	4.12 (105)	-	0.50 (13)	0.53 (13)
RQ-800 B	50A	800 (363)	0.13 (3)	1.66 (42)	5.38 (137)	3.25 (83)	4.12 (105)	-	0.50 (13)	0.53 (13)
RQ-925 B	60A	925 (420)	0.13 (3)	1.66 (42)	5.38 (137)	3.25 (83)	4.12 (105)	-	0.50 (13)	0.53 (13)
RQ-1425 B	70A	1425 (646)	0.13 (3)	1.66 (42)	5.38 (137)	3.25 (83)	4.12 (105)	-	0.50 (13)	0.53 (13)
RQ-525 C	40A	525 (238)	0.13 (3)	1.66 (42)	6.25 (159)	3.94 (100)	5.00 (127)	-	0.75 (19)	0.53 (13)
RQ-1000 C	50A	1000 (454)	0.13 (3)	1.66 (42)	6.25 (159)	3.94 (100)	5.00 (127)	-	0.75 (19)	0.53 (13)
RQ-1250 C	60A	1250 (567)	0.13 (3)	1.66 (42)	6.25 (159)	3.94 (100)	5.00 (127)	-	0.75 (19)	0.53 (13)
RQ-1950 C	70A	1950 (885)	0.13 (3)	1.66 (42)	6.25 (159)	3.94 (100)	5.00 (127)	-	0.75 (19)	0.53 (13)



Cut-Away Showing Internal Interlocking Steel



Specifications

Vibration isolators shall be neoprene, molded from oil-resistant compounds, with a cast-in-top steel load transfer plate for bolting to supported equipment and a bolt-down plate with holes provided for anchoring to the supporting structure. Isolator shall provide lateral load resistance for loads applied parallel to mounting surface.

Neoprene vibration isolators shall have minimum operating static deflections as shown on the Vibration Isolation Schedule or as indicated on the project documents but not exceeding published load capabilities.

Neoprene vibration isolators shall be Model RQ, by Kinetics Noise Control, Inc.

KINETICS Noise Control

United States
6300 Irelan Place
P.O. Box 655
Dublin, Ohio 43017
Phone: 614-889-0480
Fax: 614-889-0540

Canada
3570 Nashua Drive
Mississauga, Ontario
L4V 1L2
Phone: 905-670-4922
Fax: 905-670-1698

www.kineticsnoise.com
sales@kineticsnoise.com

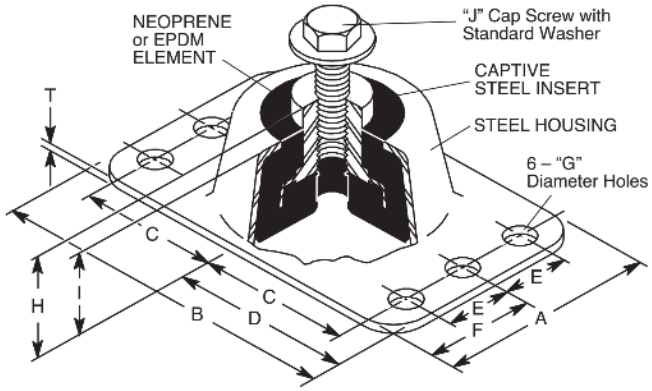
Kinetics Noise Control, Inc. is continually upgrading the quality of our products. We reserve the right to make changes to this and all products without notice.

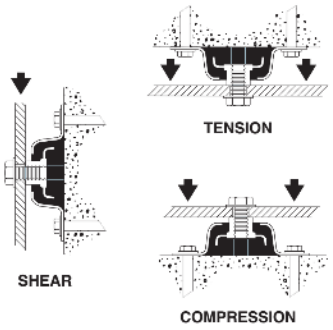
MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279
Info@Mason-Ind.com
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738
Info@MasonAnaheim.com
www.Mason-Ind.com

JOB NAME _____
CUSTOMER _____
CUSTOMER P.O. _____
MASON M. _____
DWG No. _____

RAA, RBA RCA & RDA

Captive Mounting





TYPE RAA, RBA, RCA and RDA DIMENSIONS (inches *millimeters*)

Type	A	B	C	D	E	F	G	H	I	J	T
RAA	2 5/8 *67*	4 1/4 *108*	1 11/16 *43*	2 1/8 *54*	7/8 *22*	15/16 *33*	7/16 *11*	1 1/2 *38*	1 1/8 *29*	3/8-16UNC x 1	3/32 *2*
RBA	3 *76*	4 3/4 *121*	1 15/16 *49*	2 3/8 *60*	1 *25*	1 1/2 *38*	7/16 *11*	1 7/8 *48*	1 1/2 *38*	1/2-13UNC x 1 1/4	3/32 *2*
RCA	3 3/4 *95*	6 1/4 *159*	2 1/2 *64*	3 1/8 *79*	1 1/4 *32*	1 7/8 *48*	9/16 *14*	1 7/8 *48*	1 1/2 *38*	5/8 -11UNC x 1 1/4	3/32 *2*
RDA	5 *127*	8 *203*	3 1/4 *83*	4 *108*	1 3/4 *44*	2 1/2 *64*	3/4 *19*	2 3/8 *60*	1 7/8 *48*	7/8 -9UNC x 1 1/4	1/8 *3*

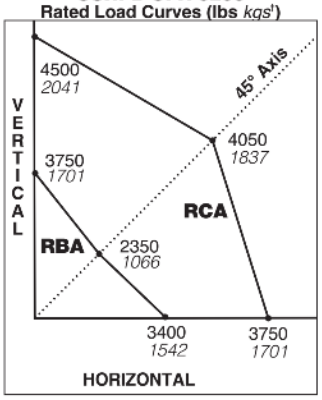
TYPE RAA, RBA, RCA and RDA RATINGS

Type	Size (Color Mark)	Duro-meter	COMPRESSION Rated Capacity (lbs) *(kgs)*	COMPRESSION Rated Defl (in)*(mm)*	TENSION Rated Capacity (lbs) *(kgs)*	TENSION Rated Defl (in)*(mm)*	SHEAR Rated Capacity (lbs) *(kgs)*	SHEAR Rated Defl (in)*(mm)*	Maximum Horizontal Static G Rating*
RAA-	Black Green White	30 45 60	200 *91* 300 *136* 500 *227*	0.10 *3*	150 *68* 200 *91* 400 *181*	0.08 *2*	150 *68* 200 *91* 400 *181*	0.08 *2*	7.0 5.0 2.5
RBA-	Black Green White	30 45 60	250 *113* 525 *238* 1000 *454*	0.15 *4*	200 *91* 420 *191* 800 *363*	0.12 *3*	200 *90* 420 *191* 800 *363*	0.09 *2*	13.6 6.5 3.4
RCA-	Green Red White	40 50 60	1400 *635* 2100 *953* 3500 *1588*	0.15 *4*	1000 *454* 1500 *680* 2500 *1134*	0.12 *3*	400 *181* 600 *272* 1000 *454*	0.09 *2*	2.7 1.8 1.1
RDA-	Green Red White	40 50 60	2800 *1270* 4200 *1910* 7100 *3230*	0.18 *5*	2000 *910* 2900 *1320* 4200 *1910*	0.15 *4*	900 *410* 1300 *590* 1800 *820*	0.12 *3*	3.3 2.2 1.3

All Rated Capacities are based on proper neoprene loadings without metal to metal contact. Seismic Max. G Ratings are based on metal failure under static seismic loadings as defined in the building codes.

*Horizontal G Ratings are for quick reference only– Use OSHPD Rated Load Curves.

OSHPD OPA-0200
Rated Load Curves (lbs *kgs*')



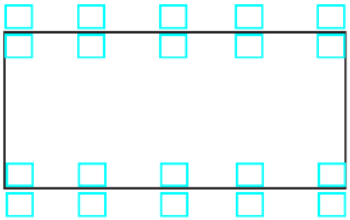
Horizontal, Vertical and 45° plotted Ratings are California OSHPD approved values having the OSHPD Anchorage Preapproval Number OPA-0200. Testing and calculations were performed to meet OSHPD criteria.

To use approved OSHPD rated load curves: 1) Calculate Vertical and Horizontal Forces on mounting including translations and overturning moments. 2) Plot Horizontal Load vs Vertical Load. The point must fall within the area below the OSHPD curve. RAA's and RDA's have not been submitted to OSHPD.

PLAN VIEW OF MOUNT LOCATIONS

TAG: _____
UNIT: _____

Click with mouse for each location >



SPECIFIED DEFLECTION

1:	6:
2:	7:
3:	8:
4:	9:
5:	10:
Sets Required:	

Certification Form S-407 02/2013	DWN	CHKD	DATE	DWG No.

FS-ONE
Technical Data

At 73°F (23°C) and 50% relative humidity

Chemical basis
Water-based intumescent acrylic dispersion

Density
Approx. 1.5 g/cm³

Color
Red

Working time
Approx. 20-30 min.

Curing time
Approx. 14-21 days

Shore A Hardness
Approx. 35

Movement capability
Approx. 5%

Intumescent Activation
Approx 250°F (121°C)
Expansion rate (unrestricted):
Up to 3-5 times original volume

Temperature resistance (cured)
–40°F to 212°F (–40°C to 100°C)

Application temperature
35°F to 100°F (2°C to 38°C)

Surface burning characteristics (ASTM E 84-96)
Flame Spread: 0
Smoke Development: 5

Sound transmission classification
ASTM E 90-97: 56

Approvals

ICBO Evaluation Service, Inc.
Report No. 5071

California State Fire Marshal
Listing No. 4485-1200:108

City of New York
MEA 326-96-M Vol. IV

Tested in accordance with
- UL 1479
- ASTM E 814
- ASTM E 84

Internationally tested and approved

c UL us — FILL, VOID OR CAVITY MATERIAL FOR USE IN THROUGH-PENETRATION FIRESTOP SYSTEMS SEE UL FIRE RESISTANCE DIRECTORY 66Y7

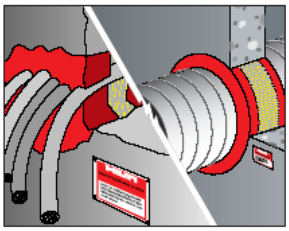
FM APPROVED

FCG -BM- SYSTEM COMPATIBLE

latest product information : www.us.hilti.com

ordering information see page: 30

FS-ONE
High Performance Intumescent Firestop Sealant



System Advantage / Customer Benefits
- Protects most typical firestop penetration applications
- Easy to work with and fast cleanup
- Can be repenetrated when laying new cables
- Can be painted

Product description
- Intumescent (expands when exposed to fire) firestop sealant that helps protect combustible and non-combustible penetrations for up to 4 hours fire rating

Product features
- Smoke, gas and water resistant
- Contains no halogen, solvents or asbestos
- High fire rating properties
- Water based, easy to clean

Areas of application
- Steel, copper and EMT pipes
- Insulated steel and copper pipes
- Cable bundles
- Closed or vented plastic pipes
- HVAC penetrations

For use with
- Concrete, masonry, drywall and wood floor assemblies
- Wall and floor assemblies rated up to 4 hours

Examples
- Sealing around plastic pipe penetrations in fire rated construction
- Sealing around combustible and non-combustible penetrations in fire rated construction

Installation instructions for FS-ONE

Opening

1. Clean the opening. Surfaces to which FS-ONE will be applied should be cleaned of loose debris, dirt, oil, moisture, frost and wax. Structures supporting penetrating items must be installed in compliance with local building and electrical standards.

Application of firestop sealant

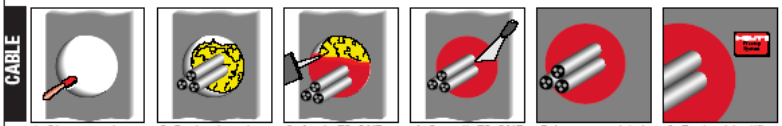
2. Install the prescribed backfilling material type and depth to obtain the desired rating (if required). Leave sufficient depth for applying FS-ONE.
3. Application of firestop sealant: Apply FS-ONE to the required depth in order to obtain the desired fire rating. Make sure FS-ONE contacts all surfaces to provide maximum adhesion. For application of FS-ONE use a standard caulking gun, foil pack gun, bulk loader and bulk gun. With FS-ONE buckets, Graco type sealant pumps may be used. (Contact pump manufacturer for proper selection).
4. Smoothing of firestop sealant: To complete the seal, tool immediately to give a smooth appearance. Excess sealant, prior to curing, can be cleaned away from adjacent surfaces and tools with water.
5. Leave completed seal undisturbed for 48 hours.
6. For maintenance reasons, a penetration seal could be permanently marked with an identification plate. In such a case, mark the identification plate and fasten it in a visible position next to the seal.

Notice about approvals
- Check that the penetration has been sealed according to the specified drawing in the UL Fire Resistance Directory or Hilti Firestop Manual. For further advice, please contact Hilti customer service. Refer to Hilti product literature and UL fire resistance directory for specific application details.

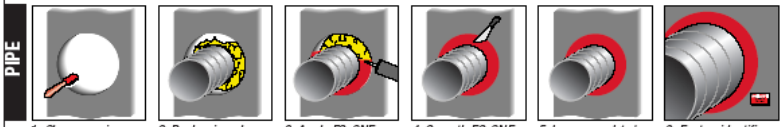
Not for use...
- High movement expansion joints
- Underwater
- On materials where oil, plasticizers or solvents may bleed i.e. impregnated wood, oil based seals, green or partially vulcanized rubber
- In any penetration other than those specifically described in this manual or the test reports

Safety precautions
- Before handling, read the product and Material Safety Data Sheet for detailed use and health information
- Keep out of reach of children
- Wear suitable gloves and eye protection

Storage
- Store only in the original packaging in a location protected from moisture at temperatures between 40°F (5°C) and 86°F (30°C)
- Observe expiration date on the packaging



1. Clean opening. *2. Pack mineral wool. (If required)* *3. Apply FS-ONE.* *4. Smooth FS-ONE.* *5. Leave completed seal undisturbed for 48 hours.* *6. Fasten identification plate (if required).*

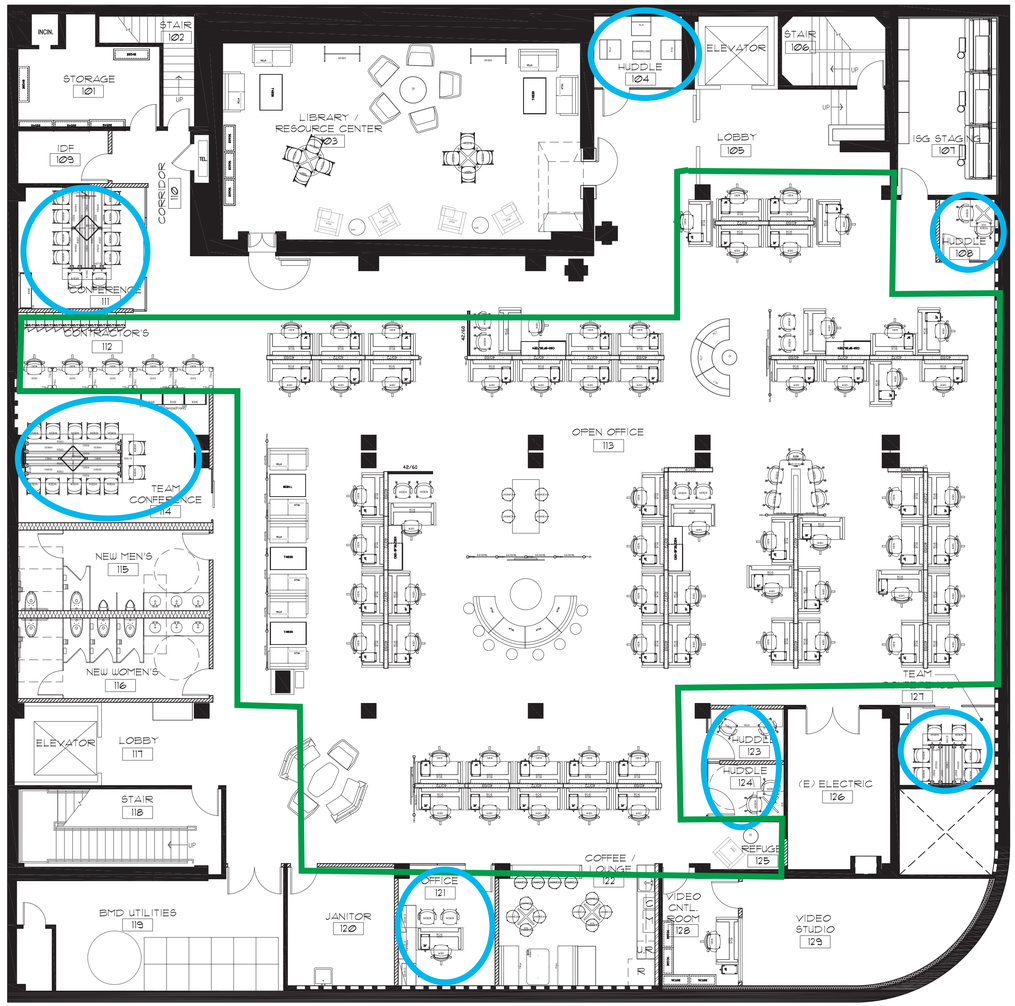


1. Clean opening. *2. Pack mineral wool. (If required)* *3. Apply FS-ONE.* *4. Smooth FS-ONE.* *5. Leave completed seal undisturbed for 48 hours.* *6. Fasten identification plate (if required).*

Sound Masking Layout

Lower noise level sound masking. Provide shut off option for teleconferencing.

Higher noise level sound masking.



1 LOWER LEVEL PLAN

SCALE: 1/8" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
410 TWELFTH STREET, SUITE 300
OAKLAND, CA 94612
Ph: 510.446.2244 Fx: 510.446.2242
ktc@ktarch.com www.ktarch.com

LOWER LEVEL FURNITURE PLAN

ITD HEADQUARTERS
393 13TH STREET
OAKLAND, CA 94612

95% CD'S

REVISIONS

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DATE: 10/10/2016

DRAWN BY: WY

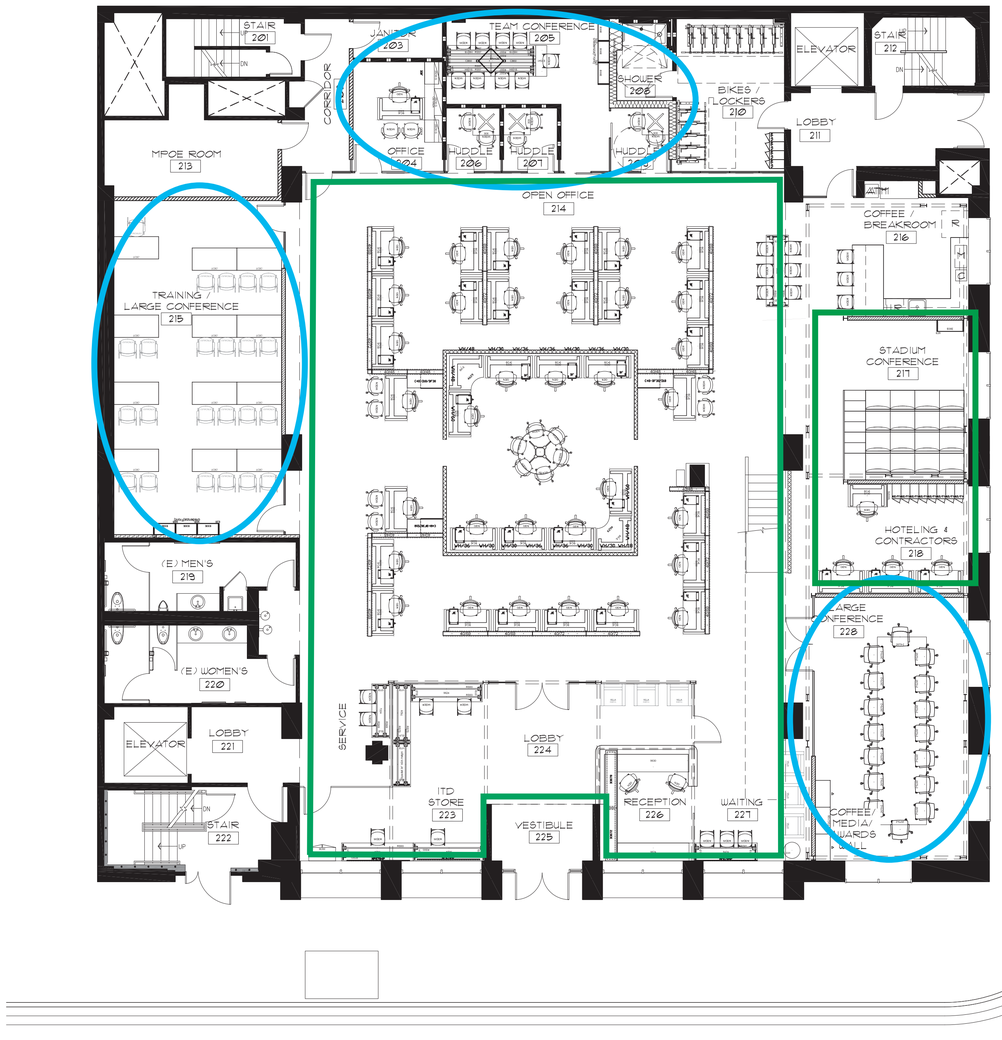
PROJECT NO.: 1203.22

A4.1

Sound Masking Layout

Lower noise level sound masking. Provide shut off option for teleconferencing.

Higher noise level sound masking.



1 FIRST FLOOR PLAN

SCALE: 1/8" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
410 TWELFTH STREET, SUITE 300
OAKLAND, CA 94612
Ph: 510.446.2244 Fx: 510.446.2242
ko@ktarch.com www.ktarch.com

FIRST FLOOR FURNITURE PLAN

ITD HEADQUARTERS
393 13TH STREET
OAKLAND, CA 94612

95% CD'S

REVISIONS

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DATE: 10/10/2016

DRAWN BY: WY

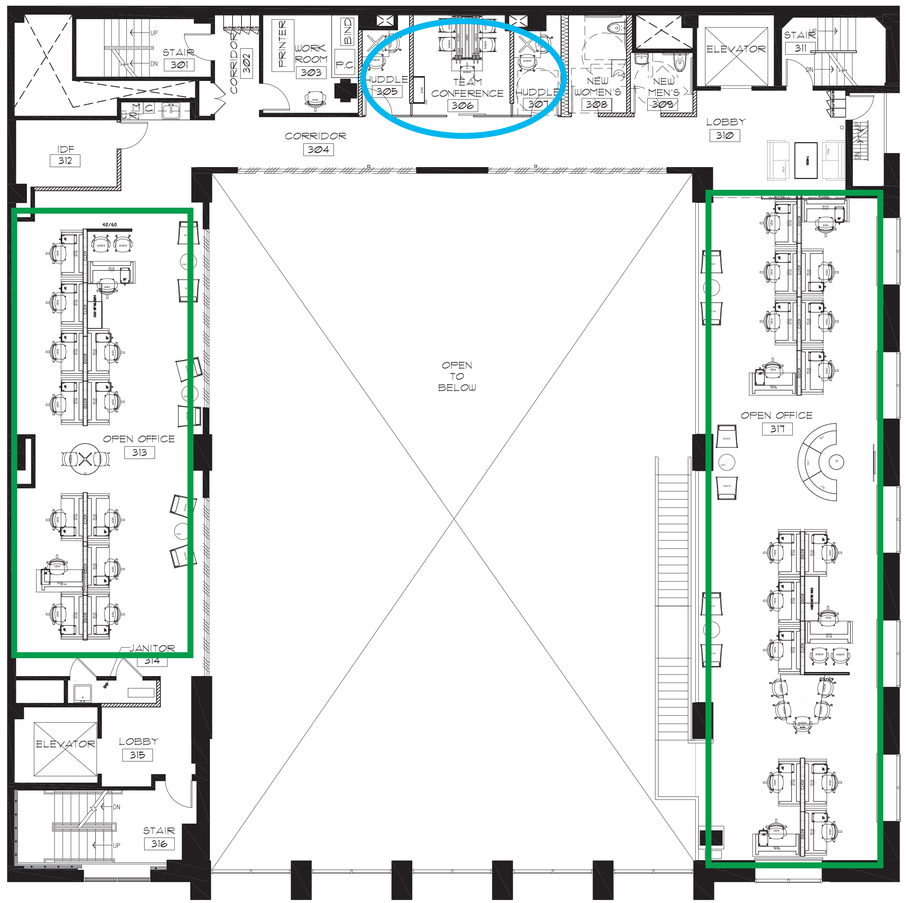
PROJECT NO.: 1203.22

A4.2

Sound Masking Layout

Lower noise level sound masking. Provide shut off option for teleconferencing.

Higher noise level sound masking.



1 MEZZANINE FLOOR PLAN

SCALE: 1/8" = 1'-0"

N

KOMOROUS-TOWEY ARCHITECTS
410 TWELFTH STREET, SUITE 300
OAKLAND, CA 94612
Ph: 510.446.2244 Fx: 510.446.2242
ko@ktarch.com www.ktarch.com

MEZZANINE FURNITURE PLAN

ITD HEADQUARTERS
393 13TH STREET
OAKLAND, CA 94612

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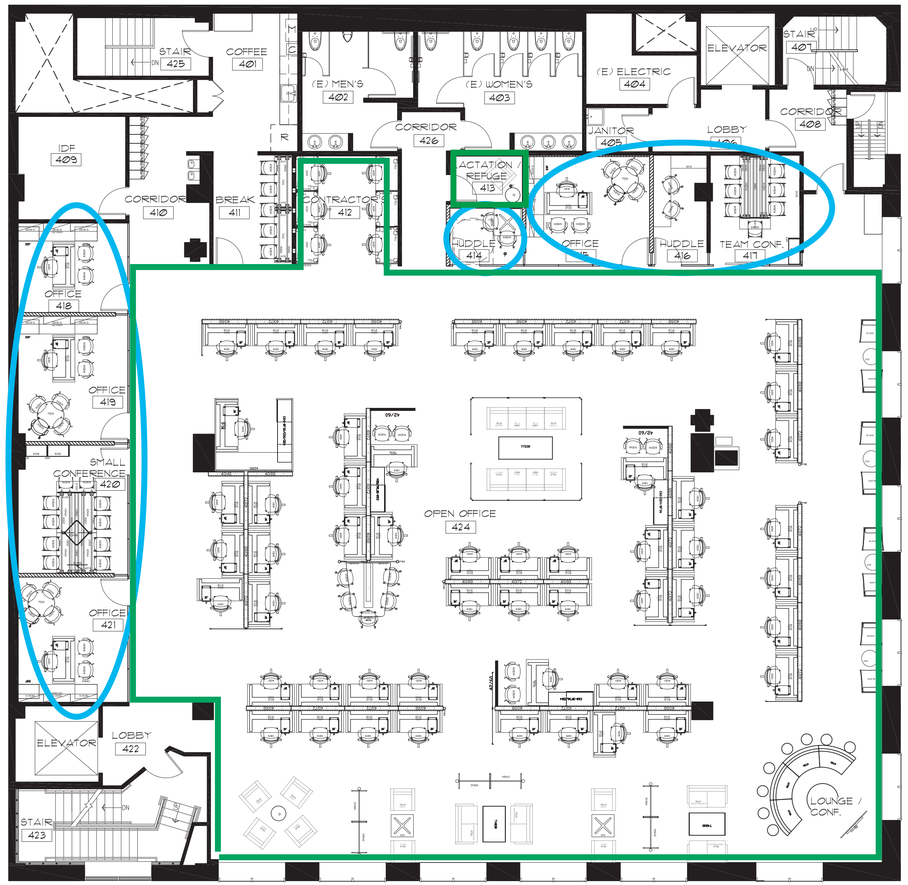
PROJECT NO.: 1203.22

A4.3

Sound Masking Layout

Lower noise level sound masking. Provide shut off option for teleconferencing.

Higher noise level sound masking.



N

1 SECOND FLOOR PLAN

SCALE: 1/8" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
410 TWELFTH STREET, SUITE 300
OAKLAND, CA 94612
Ph: 510.446.2244 Fx: 510.446.2242
ko@ktarch.com www.ktarch.com

SECOND FLOOR FURNITURE PLAN

ITD HEADQUARTERS
393 13TH STREET
OAKLAND, CA 94612

95% CD'S

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DRAWN BY: WY

PROJECT NO.: 1203.22

A4.4

Sound Masking Layout

Lower noise level sound masking. Provide shut off option for teleconferencing.

Higher noise level sound masking.

1 THIRD FLOOR PLAN
SCALE: 1/8" = 1'-0"

KOMOROUS-TOWEY ARCHITECTS
410 TWELFTH STREET, SUITE 300
OAKLAND, CA 94612
Ph: 510.446.2244 Fx: 510.446.2242
ko@ktarch.com www.ktarch.com

THIRD FLOOR FURNITURE PLAN

ITD HEADQUARTERS
393 13TH STREET
OAKLAND, CA 94612

95% CD'S

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DATE: 10/10/2016
DRAWN BY: WY
PROJECT NO.: 1203.22

A4.5

SECTION 09 82 00

ACOUSTICAL INSULATION AND SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Acoustic batt insulation.
2. Acoustic boards.
3. Acoustical sealants and accessories.

B. Related Requirements:
1. Thermal Insulation: Section 07 21 00.
2. Joint Sealants: Section 07 92 00.
3. Gypsum Board: Section 09 29 00.
4. Acoustical Treatment: Section 09 80 00; acoustic and vibration isolation devices.
5. Acoustical Wall and Ceiling Finishes: Section 09 83 10.
6. Plumbing: Division 22; plumbing pipe insulation.
7. Heating, Ventilating, and Air Conditioning: Division 23; mechanical pipe and duct insulation.
8. Acoustical Report: Appendix A.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.

1.3 ACTION SUBMITTALS

A. Product Data: Manufacturer's specifications for each type of insulation and sealant.

B. Sustainable Design (LEED):
1. General:
a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
b. Sustainable design submittals are in addition to other submittals.
c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.

2. The following information shall be provided:
   a. Credit MR 4:
      1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
      2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
      3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
   b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.
   c. Credit EQ 4.1:
      1) Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for field-applied adhesives and sealers used inside of the weatherproofing barrier of the building demonstrating compliance with SCAQMD Rule #1168.
      2) Manufacturer's product data for aerosol adhesives used inside of the weatherproofing barrier of the building, including printed statement of VOC content that demonstrates compliance with the limits defined in Green Seal Standard GS-36.

C. Samples: Each type of pipe isolation system or product.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Clearly identify manufacturer, contents, brand name, and applicable standard.

B. Comply with manufacturer's recommendations for handling, storage, and protection during installation.

C. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. Sustainable Design:
   1. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
      a. Architectural Sealants: 250 g/L.
      b. Sealant Primers for Nonporous Substrates: 250 g/L.
      c. Sealant Primers for Porous Substrates: 775 g/L.

2. Acoustic batt insulation shall be GREENGUARD Gold Certified.

B. Preformed Units: Provide sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.

C. Comply with Flame Spread Rating and Smoke Density requirements of CBC Section 707.

2.2 MATERIALS

A. Sound-Control Batt: Unfaced, friction fit, formaldehyde free, preformed slag mineral or glass fiber with thermosetting resin binders, conforming to ASTM C665, Type I.
   1. Thicknesses: As required to achieve the STC values for each assembly as specified in the Acoustical Design Narrative.
   2. Surface Burning Characteristics: ASTM E84.
      a. Smoke Developed: 50 or less.
      b. Flame Spread: 25 or less.
   3. Combustibility: Pass ASTM E136.
   4. Manufacturers and Products:
      a. Basis of Design: Owens-Corning “Eco-Touch,”
      b. Additional Acceptable Products: “EcoBatt QuietTherm” by Knauf Insulation LLC, or equal.

B. Acoustical Sealants:
   1. Non-Rated Conditions: USG "Sheetrock Acoustical Sealant," Tremco “Acoustical Sealant,” Henry's "Sound Control Sealant" No. 413, or equal conforming to ASTM C919 or equivalent.
   2. Fire-Rated Partition Perimeter Conditions: USG "Sheetrock Acoustical Sealant,” Jaco “Fire and Draft Sealer,” or equal.

C. Acoustical Tape: Low-density PVC foam; "Norseal" V-730 Series by Norton Performance Plastics Corp. or equal.

D. Pipe Isolation Systems: As specified in Section 09 80 00 Acoustical Treatment.

E. Electrical Box Treatment: As specified in Section 09 80 00 Acoustical Treatment.

F. Sealant Backer Rod: Compressible, rod-stock, polyethylene foam; nongassing, polyethylene-jacketed polyurethane foam; butyl-rubber foam; neoprene foam; or other flexible, permanent, durable, nonabsorptive, closed-cell material as recommended for compatibility with sealant by sealant manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas scheduled to receive insulation so as to ensure protection against inclement weather and other hazards and to verify that work of preceding trades is completed.

B. Examine space allocated for insulation for proper depth to receive material.

3.2 INSTALLATION OF ACOUSTICAL INSULATION

A. Install to fill completely all typical and odd spaces in framing where required.

B. Install snugly between framing members. Fit ends snugly between units and against adjacent construction.

C. Carefully cut and fit insulation around pipes, conduit, and other obstructions and penetrations.

D. At doorframes, cut additional strips of insulation, and hand-pack as necessary to fill voids thoroughly.

E. Install glass fiber batt insulation, R=11 minimum, in otherwise uninsulated wall or ceiling cavities containing plumbing pipes.

3.3 SOUND ISOLATION

A. Comply with the sound-isolation requirements for assemblies and penetrations shown and specified in Appendix C Acoustical Report.

B. Acoustical sealant shall be installed in accordance with ASTM C919 and manufacturer's recommendations.

C. Prior to closing walls, obtain observation of insulation installation by County’s Representative.

3.4 PROTECTION

A. Protect installed insulation from physical abuse. Coordinate with Section 09 29 00 Gypsum Board for prompt installation of gypsum board.

END OF SECTION 09 82 00

SECTION 09 83 10

ACOUSTICAL WALL AND CEILING FINISHES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Graphic fabric covered acoustical wall and ceiling panels, custom printed with images to be provided in digital format by County's Representative.
2. Perforated gypsum board wall and ceiling panels.
3. Formed, perforated metal wall panels with acoustical liner and backing.

B. Related Requirements:
1. Architectural Wood Casework: Section 06 41 00; fabric-covered acoustical panels in connection with casework.
2. Gypsum Board: Section 09 29 00.
3. Acoustical Ceilings: Section 09 51 00.
4. Wall Covering: Section 09 72 00.
5. Acoustical Treatment: Section 09 80 00.
6. Product and Finish Schedule: Sheet A7.0.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout.

1.3 ACTION SUBMITTALS

A. Shop Drawings:
1. Elevations of each surface to receive acoustical panels or finishes, showing layout and joint pattern dimensions as applicable.
2. Details showing anchorage, perimeter and corner conditions, acoustical backing, and interface with adjacent products, systems, and finishes.

B. Product Data: Manufacturer's specifications and installation recommendations.

C. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided as applicable:
      a. Credit MR 4:
         1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
         2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
         3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
      b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.
      c. Credit EQ 4.1: Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for field-applied adhesives and sealers used inside of the weatherproofing barrier of the building demonstrating compliance with SCAQMD Rule #1168.
      d. Credit EQ 4.4: Composite wood and agrifiber materials manufacturers' product data stating that they contain no added urea-formaldehyde resins.
         1) Include statement indicating costs for each product.

D. Samples:
   1. Minimum 12 inch x 12 sample of each type or color of panel or finish, including acoustic backing where applicable. Samples shall illustrate edge and corner treatment.
   2. Each type of mounting or attachment device, if requested by County's Representative.

1.4 INFORMATIONAL SUBMITTALS

A. Certification that wall panels and finishes meet specified performance requirements.
   1. Submit manufacturer's documentation or technical data showing a printed statement of a Noise Reduction Coefficient (NRC) of 0.70 or higher, unless a lower NRC is specified.

B. Installer qualifications for each system.

1.5 CLOSEOUT SUBMITTALS

A. Manufacturer's printed maintenance instructions for each type of finish used.

1.6 QUALITY ASSURANCE

A. Mockups: First installed example of each type of acoustical wall paneling or finish shall serve as a mockup for review by County's Representative of workmanship, visual effect, and interface with adjacent construction.
   1. Include at least two adjacent panels where applicable.
   2. Mockups shall illustrate perimeter and corner conditions.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. Installed products shall have a Noise Reduction Coefficient (NRC) of 0.65 or higher for perforated gypsum board, 0.70 or higher for other systems.

B. Fire Performance Characteristics:
   1. Fire Hazard Classification: Class A.
   2. Flame Spread: 25 or less.
   3. Smoke Developed: 450 or less.

2.2 GRAPHIC ACOUSTICAL PANELS

A. Manufactured System: Clipso Sound or equal, custom printed 495 D fabric over two layers of 3/8-inch LA 53 synthetic batting.
   1. Size: 3/4 inch thick x dimensions indicated on the Drawings; up to 9 feet x 40 feet image without seams.
   2. Edges:
      a. Edge Moldings: Aluminum and/or ABS, in profile as selected by County's Representative from manufacturer's standard profiles.
      b. Resin hardened with a modified polyester resin underneath the heat-formed co-polymer. Cured resin shall achieve a Barcol hardness of 34.
      c. Fill and sand edges to ensure straightness and profile. Soft and non-framed edge treatments are not acceptable.
   3. Fabric Facing: As scheduled; custom printed.
      a. Size: As shown; image size plus sufficient material to allow for complete wrapping of fabric at panel edges and ends.
      b. Flammability: Comply with CA Bulletin 117 2013, UFAC Class 1, and NFPA 260 Class 1.
      c. Stain Protection: Permanent, Greenguard Certified, with no detectable VOCs and no formaldehyde.

2.3 PERFORATED GYPSUM BOARD PANELS

A. Manufactured System: Vogl or equal, "Acoustic Design Panels."
   1. Description: One layer 12.5 mm, installed with Vogl Fuge ® / Vogl Joint, edge-to-edge and fixed to the substructure using suitable screws for perforated panels out of the Vogl Fuge ® / Vogl Joint System Kit including VoglFriestape-Set® as manufactured by Vogl Ceiling Systems, Emskirchen, Germany and distributed by Pyrok, Inc., Mamaroneck, NY, 914-77-7070, www.pyrok.com or equal.
      a. Contact: CADE Architectural Resources, E. Earl Carter, ecarter@caderesources.com, (415) 805-8584.
   2. Perforation Pattern: 8/18R (8 mm perforation round, center to center 18 mm).
   3. Thickness: 1/2 inch (12.5 mm).
   4. NRC: Not less than 0.65 with 200 mm ceiling void and coefficient 0.61 at 250 Hz, 0.74 at 500 Hz and 0.66 at 4,000 Hz.
   5. Mounting: Manufacturer's standard screw mounting.

2.4 FORMED, PERFORATED METAL PANELS

A. Manufactured System: CeilingsPlus or equal, "Wallforms Formed Metal Wall Panel System."
   1. Panels: Non-combustible aluminum core with factory finish and perforations as scheduled in Product and Finish Schedule on Sheet A7.0.
      a. Provide factory-installed acoustical liner and backing as indicated or required for specified acoustical performance.
      b. Panel Sizes and Configurations: As scheduled.
   2. Mounting: Slotted hat channel or "Z" clips.

2.5 BACKING AND ACCESSORIES

A. Provide fiberglass batts and other acoustical backing as shown on the Drawings and/or required for specified acoustical performance.

B. Provide anchorage, perimeter treatment, corner treatment, and other accessories as shown or scheduled, as recommended by manufacturer, and/or as specified in Section 09 29 00 Gypsum Board.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces to receive acoustical panels and finishes are acceptable for installation.

B. Inspect panels and accessories for damage. Do not install defective products.

3.2 INSTALLATION

A. Install panels and finishes in accordance with reviewed submittals and manufacturer's installation instructions and recommendations.

B. Install level, flat, and straight.

C. Apply panels and finishes with pattern in same direction.

D. Minimum Width of End Panels: One-half unit dimension, unless otherwise shown.

3.3 CLEANING

A. Clean soiled or discolored surfaces after installation. Replace panels, fabric, or surfaces that cannot be cleaned to satisfaction of County's Representative.

B. Remove and replace damaged or improperly installed acoustical finishes, and replace with new acoustical finishes.

END OF SECTION 09 64 10

SECTION 09 90 00

PAINTING AND COATING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Painting and painter's finish to complete the finishing of the work.
   1. Interior: All surfaces, both new and existing, except prefinished items and as otherwise noted. Includes:
      a. Painted projection surfaces.
      b. Painting of concrete stair landings in existing stairwells.
      c. Lettering and striping for existing concrete floor at electrical and mechanical areas.
   2. Exterior: New surfaces and designated existing surfaces.

B. Related Requirements:
   1. Signage: Section 10 14 00; painted signage.
   2. Product and Finish Schedule: Sheet A7.0.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
   3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

1.3 ACTION SUBMITTALS

A. Product Data: A complete list of materials proposed for use, together with manufacturer's technical information, including paint label analysis and application instructions. Information shall be grouped by System using same System identification included in these Specifications.

B. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.

2. The following information shall be provided:
   a. Credit EQ 4.2:
      1) Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for all paints and coatings used inside of the weatherproofing barrier of the building and demonstrating compliance with Green Seal standard GS-1.
      2) Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for all anti-rust coatings used inside of the weatherproofing barrier of the building and demonstrating compliance with Green Seal standard GS-03.
      3) Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for all clear wood finishes, floor coatings, stains, primers, and shellacs used inside of the weatherproofing barrier of the building and demonstrating compliance with SCAQMD Rule #1113.

C. Color Samples:
   1. Appropriately label and identify each sample, including location and application. Include scheduled "P" number, manufacturer's name, color number, and gloss units.
   2. Gypsum Board: Prepare on gypsum board with specified level of finish, 18 inches square.
   3. Wood: Prepare on type and quality of wood specified, 12 inches long.
   4. Other Surfaces: Prepare on hardboard, 8 inches square.
   5. Each sample shall have stepped finish, clearly showing each coat and build-up of specified finish. Submit separate samples for each required gloss level.
   6. Resubmit samples as requested until required sheen, color, and texture are achieved.
   7. See also requirements for field samples below.

1.4 INFORMATIONAL SUBMITTALS

A. Statement of applicator qualifications.

B. Field test reports verifying that floor paint and striping meet specified requirements for slip resistance.

1.5 CLOSEOUT SUBMITTALS

A. Extra stock as specified.

1.6 QUALITY ASSURANCE

A. Single-Source Responsibility:
   1. To the maximum extent practicable, select a single manufacturer to provide all materials required by this Section, using additional manufacturers to provide systems not offered by the selected principal manufacturer.

2. For Each Individual System:
    a. Provide primer and other undercoat paint produced by same manufacturer as finish coat.
    b. Use thinner within manufacturer's recommended limits.

B. Applicator Qualifications:
1. Not less than 5 years of documented experience in painting work similar in scope to work of this Project and with sufficient personnel to meet the approved Construction Schedule.
2. Maintain a crew of painters who are fully qualified to satisfy requirements of this Section.

C. Field Samples:
1. County's Representative will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3 and for each color scheme.
    a. Vertical and Horizontal Surfaces: Provide samples of at least 100 square feet.
    b. Other Items: County's Representative will designate items or areas required.
2. Request review, by the County's Representative, of mockup area or item of each color scheme required for color, texture, and workmanship.
3. Modify selected colors or gloss levels, if requested by County's Representative, to achieve desired effect.
4. Final approval of color selections will be based on mockups with accepted mockups serving as the Project standard for each color scheme.
5. Approval of field samples does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by the County's Representative in writing.

D. Primers:
1. Provide finish coats that are compatible with prime paints used.
2. Review other Sections of these Specifications in which prime paints are to be provided in order to ensure compatibility of total coatings system for various substrates.
3. Upon request, furnish information to other Sections regarding characteristics of finish materials proposed for use.
4. Provide barrier coats over incompatible primers, or remove and re-prime as required.
5. Notify County's Representative, in writing, of any anticipated problems arising from using specified coating systems with substrates primed by other Sections.

E. Slip Resistance: Floor paint and striping shall have a minimum wet and dry coefficient of friction of 0.60 when field tested in accordance with ASTM C1028.
1. Slip resistance of striping shall be not less than that of the flooring or paving to which it is applied.

2. Provide field test reports verifying that floor paint and striping meet specified requirements for slip resistance.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original, new, unopened packages and containers bearing the manufacturer's name and label and the following information:
   1. Name or title of material.
   2. Manufacturer's stock number and date of manufacture.
   3. Manufacturer's name.
   4. Contents by volume for major pigment and vehicle constituents.
   5. Thinning instructions.
   6. Application instructions.
   7. Color name and number.

B. Store materials in tightly covered containers within ambient temperature range recommended by coating manufacturer. Maintain containers in a clean condition, free of foreign materials and residue.

C. Take precautionary measures to prevent fire and health hazards.

D. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

1.8 FIELD CONDITIONS

A. Ambient Conditions:
   1. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be stored and applied.
   2. Do not apply finish in areas where dust is being generated.

B. Protection: Cover or otherwise protect finished work of other trades and surfaces not being painted concurrently or not to be painted.

C. Substrates:
   1. Perform no painting work when the maximum moisture content of the substrate, either new or existing, exceeds the limits recommended by the coating manufacturer or the following, whichever is greater:
      a. Concrete and Gypsum Board: 12 percent.
      b. Wood: 15 percent.
   2. Conduct moisture tests using a properly calibrated electronic moisture meter.

1.9 WARRANTY

A. Color and Life of Film:
   1. At the end of 1 year, colors of surfaces shall have remained free from serious fading. Variations (if any) shall be uniform.
   2. Materials shall have their original adherence at end of 1 year. There shall be no evidence of blisters, running, peeling, scaling, chalking, streaks, or stains at end of this period.

1.10 EXTRA MATERIALS

A. At completion of the Work, deliver to County extra stock ("attic stock") of paint of each color used in each coating material used.

B. Containers shall be full, tightly sealed, and clearly marked.

C. Provide the following quantities:
   1. Field Colors: One 5 gallon container.
   2. Accent and Metallic Colors: One 1 gallon container.
   3. Projection Paint and Primer: One 1 gallon container each.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND COATING PRODUCTS

A. Products are specified under "Interior Paint Systems" in Part 3 below and are manufactured by Benjamin Moore & Co. or equal and Tnemec or equal as indicated, except as otherwise specified.
   1. Proposed substitutions shall be submitted in accordance with Section 01 62 00 Product Options and Substitutions.

B. Products are specified under "Exterior Paint Systems" in Part 3 below and are manufactured by Benjamin Moore & Co. or equal and Tnemec or equal as indicated.
   1. Proposed substitutions shall be submitted in accordance with Section 01 62 00 Product Options and Substitutions.

C. Materials selected for coating systems for each type surface shall be the product of a single manufacturer or shall be acceptable to manufacturer of finish coating for system.

D. If more than one quality level of product type is marketed, use material of highest quality.

2.2 PERFORMANCE CRITERIA

A. Interior paints and coatings used shall be certified according to the latest "Green Seal Environmental Standard for Paints" (GS-11), Green Seal, Inc.

B. Coatings, primers and undercoats shall satisfy the South Coast Air Quality Management District Rule 1113 for architectural coatings.

2.3 MISCELLANEOUS MATERIALS

A. Cementitious Filler: Nonshrink formulations of white Portland cement with fine silicate aggregate, zinc oxide pigment, and reinforcing chemical binder, as accepted.

B. Spackling Compound: Standard gypsum board compound.

C. Thinner: As recommended by each manufacturer for the respective product.

D. Decorative Metallic Polyurethane Coating for Metal and Gypsum Board: Water based, VOC compliant, metallic coating with clear topcoat; "Scuffmaster" by Master Coating Technologies, Minneapolis, MN, as scheduled; or equal (no known equal).
   1. Series:
      a. Exposed Steel Structure: "Envirometal."
      b. Other Locations: “Solid Metal.”
   2. Color(s): As listed in Product and Finish Schedule on Sheet A7.0.
   3. Products shall be suitable for brush, spray, or roller application as appropriate.
   4. Provide primers, base coats, clear coat, and other products as applicable to system and to color and sheen selected by County’s Representative.

E. Projection Paint and Primer for Projection Surfaces: “Screen Goo Products” manufactured by Goo Systems Global, or equal (no known equal).

F. Traffic Paint: PPG 11-3 "Traffic and Zone Marking Paint," Glidden "Traffic Zone Paint," or equal conforming to FS TT-P-115F, Type 1.
   1. Provide striping and lettering in selected standard colors at locations indicated or as directed by the County’s Representative.
   2. Provide slip-resistant additive as required.

2.4 COLORS

A. Colors shall be as listed in Product and Finish Schedule on Sheet A7.0.

B. Colors have been selected and provided by the County’s Representative. Selected colors may have manufacturer identifications other than from the manufacturers products included in the Paints Systems specified. The listing is solely for the purpose of conveying color information and does not imply waiver of the requirement that all coatings be from the same manufacturer unless a specific system is not available from the primary manufacturer.

C. Submit samples of scheduled and selected colors as specified in Part 1 above. Colors of paints shall match scheduled colors.

D. Areas or surfaces indicated as black, either on the Drawings or in the Specifications, shall be so painted, unless specifically directed otherwise.

E. Metallic colors will be required for designated metal items.

F. Accent colors will be high chroma and deep.

2.5 MIXING AND TINTING

A. Deliver paints and stains ready mixed to jobsite.

B. Accomplish job mixing and job tinting only if required for adjustment to finish applied to field test areas to achieve color acceptable to County's Representative.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces scheduled to receive paint and finishes for conditions that will adversely affect execution, permanence, or quality of work and that cannot be put into acceptable condition through preparatory work as included in Article 3.2, "Preparation."

B. Do not proceed with surface preparation or coating application until conditions are suitable.

3.2 PREPARATION

A. General:
   1. Broom-clean rooms and spaces before commencement of the work.
   2. Verify that surfaces to be painted are dry, clean, smooth, and free from deleterious materials.
   3. Protect hardware, nameplates, switch plates, lighting fixtures, stainless steel, aluminum, and other surfaces that are not to be painted by masking, removal, or by other means to ensure a neat job.
   4. Locate and install scaffolding and staging so as not to interfere with the work specified in other Sections.

B. Wood - General:
   1. Cleaning and Sanding:
      a. Remove handling marks and effects of exposure to moisture with a thorough, final sanding over all exposed surfaces, using 150-grit or finer sandpaper.
      b. Clean and vacuum before applying sealer or finish.
   2. Wood to Receive Opaque Finish: Fill nail holes, cracks, open joints, and other defects with filler after priming coat has dried. Color shall match finish color.

3. Wood to Receive Transparent or Semi-Transparent Finish:
    a. Remove any material that would adversely affect penetration or appearance of finish.
    b. Do not seal wood surfaces to receive transparent finish.

C. Wood – New Interior, Opaque Finish:
1. Surfaces shall be sanded smooth, free of loose dirt, dust, and oil.
2. Spot prime blemishes, nail holes, and cracks before applying overall coat of primer.
3. Lightly sand surface between coats.

D. Wood - Existing Interior, Opaque Finish:
1. Surfaces shall be clean and free of wax, grease, and water soluble materials.
2. Glossy surfaces shall be dulled by sanding. Do not use liquid deglossers.
3. Remove loose and scaling paint by scraping and sanding. Repair holes, crevices, and cracks with appropriate patching compound.
4. Scarred or chipped spots shall be aggressively sanded to feather them flush with the surface.

E. Gypsum board shall be prepared and finished for painting as specified in Section 09 29 00 Gypsum Board.

F. Metals:
1. Remove mill scale, rust, and corrosion.
2. Clean oils, grease, and dust from surfaces.
3. Touch up chipped or abraded areas in shop coatings, using appropriate primer.
4. Soluble Salts: Removal of soluble salts from bare metal and galvanized metal surfaces, both interior and exterior, is required prior to application of primer coats to preclude pre-mature coating failure and accelerated corrosion.
    a. Removal shall be in accordance with SSPC-Guide 15, “Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates.”
    b. Abrasive blasting, where specified as a required surface preparation procedure, shall be performed after removal of soluble salts. Abrasive blasting is not an acceptable procedure for removal of soluble salts.

G. Previously Painted Metal: Prepare in accordance with recommendations of coating manufacturer based on condition of surfaces and the following:
1. Remove loose paint, dirt, and chalk with scraper and strong detergent solution.
2. Abrade shiny surfaces, such as baked enamel.
3. Clean surfaces of dust from sanding and other foreign matter that could adversely affect adhesion or performance of coating system. Remove sanding dust with a clean, wet rag.
4. Surfaces shall be clean, dry, smooth, and even.

H. Ductwork: Clean visible galvanized portion of ductwork interiors with solvent, and wipe clean.

I. Concrete:
   1. Fill cracks and irregularities with Portland cement grout or patching mortar in order to provide uniform surface texture.
   2. Surfaces shall not be painted until they have completely cured and have a stabilized moisture content but in no case less than 60 days from completion of surface.

J. Surfaces that cannot be prepared or painted as specified shall be immediately brought to the attention of the County's Representative, in writing.
   1. Starting of work without such notification will be considered acceptance by the Contractor of surfaces involved.
   2. Replace unsatisfactory work caused by improper or defective surfaces, as directed by County's Representative.

3.3 FACTORY FINISHING AND PRIMING

A. Pertinent Work and Requirements Specified Elsewhere: Review all Sections for products that are to be factory finished or factory (shop) primed.

B. Touch-up: Touch up abrasions in prime coat immediately after products arrive on jobsite and as required prior to application of finish coats.

3.4 APPLICATION

A. Shop-fabricated and finished metal and millwork items shall be shop spray finished to the greatest extent possible.

B. Do not apply initial coating until moisture content of surface is within limitations recommended by paint manufacturer.

C. Application:
   1. Apply paint with suitable brushes, rollers, or spraying equipment.
   2. Stairs, guardrails, steel doorframes, and other exposed metal requiring field finish painting shall be sprayed to the fullest extent conditions will permit. If brush or roller application is used, surface finish shall be subject to review by the County's Representative for complying with the appearance requirements specified herein.
   3. Apply coatings in accordance with manufacturer's recommendations.
   4. Rate of application shall be within limits recommended by paint manufacturer for surface involved.

D. Spray-Gun Application - Standard Coatings:
   1. Spray-apply standard paints only with airless sprayer.
   2. Apply in fine, even spray, without addition of thinner, using nozzle pattern suitable to surface being painted.

3. When necessary, follow by brushing to ensure uniform coverage and to eliminate wrinkling, blistering, and air holes.
4. If spraying becomes detrimental to equipment or objectionable to personnel, brush painting will be required.

E. Comply with recommendation of product manufacturer for drying time between succeeding coats.

F. Finish coats shall be smooth and free from brush marks, streaks, laps or pileup of paints, and skipped or missed areas.

G. Leave all parts of moldings and trim clean and true to details with no undue amount of paint in corners and depressions.

H. Make edges of paint adjoining other materials or colors clean and sharp, with no overlapping.

I. Refinish whole area where portion of finish is not acceptable.

J. Adjust natural finishes as necessary to obtain identical appearance on veneers and solid stock.

K. Equipment adjacent to walls shall be disconnected, using workers skilled in appropriate trades, and moved to permit wall surfaces to be painted. Following completion of painting, they shall be expertly replaced and reconnected.

L. Top and bottom edges of all doors shall receive same paint system finish required for door faces.

M. Paint visible surfaces behind vents, registers, or grilles flat black.
1. Prepare exposed metal as specified, then prime and paint as scheduled.
2. Spray-paint wherever practicable.

N. Do not paint over fire-rating labels, fusible links, or sprinkler heads.

O. Exposed Plumbing and Mechanical Items: Items without factory finish such as conduits, pipes, access panels, and items of similar nature shall be finished to match adjacent wall and ceiling surfaces, unless otherwise directed.

3.5 CLEANING

A. Touch up and restore finish where damaged.

B. Remove spilled, splashed, or spattered paint from all surfaces.

C. Do not mar surface finish of item being cleaned.

D. Leave storage space clean and in condition required for equivalent spaces in Project.

3.6 PAINT SYSTEMS

A. General:
   1. Only major areas are scheduled, but miscellaneous and similar items and areas within room or space shall be treated with suitable system.
   2. This Specification shall serve as guide and is meant to establish procedure and quality. Confer with the County's Representative to determine exact finish desired.
   3. Number of coats scheduled is minimum. Additional coats shall be applied at no additional cost as required to hide base material completely, produce uniform color, and provide required and satisfactory finish.

B. Surfaces Not to Be Painted:
   1. Prefinished wall, ceiling, and floor coverings.
   2. Items with factory-applied final finish.
   3. Concealed ducts, pipes, and conduit.
   4. Surfaces specifically scheduled or noted on the Drawings as not to be painted.

C. Acceptance of Final Colors: Final coat of paint for both exterior and interior shall not be applied until colors have been accepted by the County's Representative.

D. Gloss and Sheen Ratings: Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following limits in conformance with Master Painters Institute, Inc. (MPI) Standards according to ASTM D523. Not all of the Gloss Levels are necessarily scheduled or used on this Project.
   1. Gloss Level 1: Matte or Flat; not more than 5 units at 60 degrees and 10 units at 85 degrees.
   2. Gloss Level 2: Velvet or Low Sheen; not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees.
   3. Gloss Level 3: Eggshell; 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees.
   4. Gloss Level 4: Satin; 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees.
   5. Gloss Level 5: Semi-gloss; 35 to 70 units at 60 degrees.
   6. Gloss Level 6: Gloss; 70 to 85 units at 60 degrees.

E. Clarification of System Terminology:
   1. Interior paint Systems are specified and identified herein by initial letters "INT."
   2. Exterior paint Systems are specified and identified herein by initial letters "EXT."
   3. The numbers following "INT" and "EXT" for each System identifies the substrate to be coated.

4. The letter following substrate number identifies the general finish coat chemistry summarized as follows:

CODE	DESCRIPTION
A	Standard acrylic
H	Polyurethane
M	Premium performance acrylic polymer

5. Hyphenated suffix identifies the topcoat gloss level.

F. Interior Painting Systems:

INT 3.2C
Colored Epoxy on Concrete Floor and Stair Landings

1 coat	Devoe "Devfloor" #506H	Waterborne Epoxy Primer
1 coat	Devoe "Devfloor" #525	100% Solids Epoxy Resurfacer at 5 to 10 mils DFT
	"Devfloor" 3571	Epoxy color additives
	As required for specified slip resistance	Slip-resistant additive

Note: Color and sheen shall match paint on adjacent metal stair

INT 5.1A-3
Low Odor Finish on Shop Primed Metal - Gloss Level 3

2 coats	"Aura" 524	Zero VOC, water-based

Note: Modify scheduled finish coat if higher or lower gloss level is selected by County's Representative.

INT 5.1M-5
Premium Performance Acrylic on Shop Primed Metal - Gloss Level 5

Surface Preparation and Shop Primer		As specified in Section 05 70 00 "Decorative Metal"
1 coat	Tnemec Series 1028 "Enduratone"	High dispersion pure acrylic polymer applied 2.0 to 3.0 mils DFT

Note: Provide additional topcoat if required to achieve complete hiding.

INT 5.1?-?
Decorative Metallic Waterborne Polyurethane on Shop Primed Metal

Surface Preparation and White Shop Primer		As specified in Section 05 70 00 "Decorative Metal"
1 coat	Scuffmaster "Solid Metal"	Base, custom color to match existing salvage metal selected by County's Representative
1 coat	Scuffmaster "Ultra Clear"	Clear Topcoat in gloss level to match accepted sample

INT 5.1?-?
Decorative Metallic Waterborne Polyurethane on Shop Primed Steel Structure

Surface Preparation and Tinted Shop Primer		As specified in Section 05 70 00 "Decorative Metal"
1 coat	Scuffmaster “Envirometal”	Metallic Base Coat

INT 6.3A-5
Low Odor Finish on Woodwork- Gloss Level 5

1 coat	“Fresh Start” 023	100% Acrylic Latex Primer
2 coats	“Aura” 528	Zero VOC, water-based

INT 6.3C
Semi-Transparent Stain on Dressed Lumber (Trinity Coatings Company)

1 coat	“Nitro Aqualac” WW Series	Waterborne Acrylic Polymer Wiping Stain
1 coat	“Nitro” LS-850	High-Build Sanding Sealer
1 coat	“Nitro” LS-852	Clear High-Solids Satin Lacquer
1 coat	“Nitro” LS-852	Clear High-Solids Satin Lacquer

INT 9.2A-1
Low Odor Finish on Smooth Finished Gypsum Board - Gloss Level 1 (Flat)

1 coat	“Fresh Start” 023	100% Acrylic Latex Primer
2 coats	“Aura” 522	Zero VOC, water-based

INT 9.2A-3
Low Odor Finish on Gypsum Board - Gloss Level 3 (Eggshell)

1 coat	“Fresh Start” 023	100% Acrylic Latex Primer
2 coats	“Aura” 524	Zero VOC, water-based

INT 9.2A-5
Low Odor Finish on Gypsum Board - Gloss Level 5 (Semi-gloss)

1 coat	“Fresh Start” 023	100% Acrylic Latex Primer
2 coats	“Aura” 528	Zero VOC, water-based

INT 9.2?-?
Projection Finish on Gypsum Board Projection Surfaces

2 coats	“Screen Goo”	Reflective Coat Primer
2 coats	“Screen Goo”	High Contrast Finish

INT 9.2?-?
Decorative Metallic Waterborne Polyurethane on Gypsum Board

1 coat	“Fresh Start” 023	100% Acrylic Latex Primer
1 coat	Scuffmaster “Solid Metal”	Base, custom color
1 coat	Scuffmaster “Ultra Clear”	Clear Topcoat in gloss level to match accepted sample

G. Exterior Painting Systems:

EXT 5.1A-5
Acrylic over Shop-Primed Metal - Gloss Level 4

2 coats		"Regal Select" N403	100% Acrylic

EXT 5.1H-5
High Performance Polyurethane over Galvanized Metal, Gloss Level 5

Pretreatment		As specified in Section 05 70 00 "Decorative Metal"
1 coat	Tnemec 27WB	Two-component, water-based epoxy tinted to match color of topcoat (if primer not shop applied)
1 coat	Tnemec UVX Series 750	Polyurethane

Note: Provide additional topcoat if required to achieve manufacturer's recommended total DFT (primer plus finish coats), or to achieve complete hiding for selected color. Comply with manufacturer's maximum recoat time.

END OF SECTION 09 90 00

SECTION 10 11 00

VISUAL DISPLAY SURFACES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Wall-mounted magnetic dry-erase glass marker boards.
2. Wall-mounted perforated metal bulletin boards.
3. Additional visual display surfaces as scheduled or shown on the Drawings.

B. Related Requirements:
1. Architectural Wood Casework: Section 06 41 00; tackable panels in connection with casework.
2. Non-Structural Metal Framing: Section 09 22 16; backing plates.
3. Gypsum Board: Section 09 29 00.
4. Painting and Coating: Section 09 90 00; painted projection surfaces.
5. Integrated Audiovisual Systems: Section 27 41 16.
6. Product and Finish Schedule: Sheet A7.0.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.

1.3 ACTION SUBMITTALS

A. Shop Drawings:
1. Provide dimensioned elevations for each wall to receive visual display boards, showing layout and joint locations.
2. Show sections of trim members; key to elevations.

B. Product Data:
1. Manufacturer's technical data for visual display boards.
2. Manufacturer's installation instructions and breaking-in instructions for each type of visual display board.
3. Exposed fasteners if proposed for use.
4. Manufacturer's cleaning and maintenance instructions covering both routine (daily or weekly) and long-term (yearly or longer) operations.

C. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 4:
         1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
         2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
         3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
      b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

D. Samples:
   1. Each type of visual display surface, trim, and mounting device.
   2. Additional samples as requested by County's Representative.
   3. Where appropriate, accepted samples may be installed as part of specified mockups and as part of finished construction.

1.4 QUALITY ASSURANCE

A. Mockups: First installed example of each type or configuration of visual display board, and each installation condition, shall serve as a mockup for review by County's Representative of workmanship, visual effect, interface with adjacent construction, and interface/performance in conjunction with specified audiovisual systems.

1.5 FIELD CONDITIONS

A. Ambient Conditions: Install boards only when interior air and substrates have reached equilibrium moisture and temperature approximating that of normal occupied conditions.

B. Take field measurements prior to shop fabrication where necessary in order to ensure proper fitting of work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Wrap or otherwise package boards and components for protection against damage during shipment and storage.

B. Store panels on edge in a manner to prevent bowing, warping, or other irregularities.

C. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

PART 2 - PRODUCTS

2.1 MARKER BOARDS

A. Manufacturer and Product: Glass whiteboard by Clarus Glassboards or equal.
   1. Panel Size: 4 feet x 8 feet.
   2. Color: Plain white.
   3. Trim: None; panels shall be factory self-edged and finished on all 4 sides.
   4. Backing: As standard with manufacturer.
   5. Layout: As shown on the Drawings.

B. Mounting System: Manufacturer's concealed wall-mounting system.

C. Tool Kit: For each room with marker boards, provide manufacturer's standard accessory kit containing markers, eraser, cleaner, wipes, and other items as required for proper use and maintenance of boards.

2.2 METAL BULLETIN BOARDS

A. Bulletin Boards: Nickel perforated metal; "Umbra Large Bulletin Board" or equal.
   1. Standard Panel Size: 15 x 21 inches; to be installed in groups of 4 as shown on the Drawings.
   2. Edge Treatment: As standard with manufacturer.
   3. Finished Sizes: As shown.

B. Mounting System: Manufacturer's concealed wall-mounting system.

2.3 ADDITIONAL VISUAL DISPLAY SURFACES

A. As scheduled in Product and Finish Schedule on Sheet A7.0.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are true and plumb, and that backing is in place.

B. Correct inadequate substrates before installation of boards.

3.2 INSTALLATION

A. Install boards in location and to layout as shown on the Drawings and in accordance with manufacturer's instructions, to match accepted mockups.
   1. Keep perimeter lines and panel joints straight, plumb, and level.
   2. Join parts with a neat, precise fit.

B. Fasten visual display surfaces to walls with concealed fasteners as recommended by manufacturer.

3.3 PROTECTION

A. Cover completed work with plastic sheet or other covering recommended by manufacturer.

B. Protect boards from damage during remainder of construction period.

END OF SECTION 10 11 00

SECTION 10 1400

SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Code-required signage as follows:
      a. Rest room identification.
      b. Elevator fire safety.
      c. Occupant load signs at assembly-type rooms.
      d. Stairway identification.
      e. Floor identification.
      f. Means of egress.
      g. Non-illuminated exit signs.
      h. Marking and identification of wall assemblies required to have protected openings and penetrations.
   2. Electrical/mechanical equipment room identification.
   3. Luminous egress path markings at interior stairs and other exit enclosures as indicated.
   4. Shop painted interior and exterior signage as indicated on the Drawings.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.

B. Coordination:
   1. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.
   2. Provide vendor and subcontractor with complete and up-to-date Drawings, Specifications, sign schedule, or other items issued by the Owner or County's Representative.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Full-scale drawings for each sign indicating materials, lettering layout, and colors.

B. Product Data: Manufacturer's specifications, recommendations, and installation instructions.

C. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.
      b. Credit EQ 4.1: Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for field-applied adhesives and sealers used inside of the weatherproofing barrier of the building demonstrating compliance with SCAQMD Rule #1168.
      c. Credit EQ 4.2: Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for all paints and coatings used inside of the weatherproofing barrier of the building and demonstrating compliance with Green Seal standard GS-1.

D. Samples:
   1. One sample of each sign type. Acceptable signs may be installed as part of the work.
   2. Complete typeface fonts, including upper and lower case letters, numbers, and punctuation.
   3. Samples of letter and word spacing for each letter size.

1.4 QUALITY ASSURANCE

A. Contractor shall assure that the vendor shall be responsible for the quality of materials and workmanship of any firm acting as the vendor's subcontractor.

B. Furnish products of a single manufacturer for each sign type and graphic image processes indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver signs safely packed to prevent damage during shipment. Package separately or in like groups of names, labeled as to names enclosed; include installation template, attachment system and installation instructions.

B. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

1.6 FIELD CONDITIONS

A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on shop drawings.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. Unless otherwise specified or shown, signage shall conform to the following standards and publications:
   1. 2010 Americans with Disabilities Act (ADA) Standards.
   2. California Code of Regulations, Titles 19 and 24. California Grade 2 Braille shall be used whenever Braille symbols are specifically required. All signage shall conform to Chapter 11B of the CBC, Division 7, Section 11B-703.
   3. ANSI A-117.1.
   4. Uniform Sign Code.

B. Sustainable Design: Adhesives and sealants applied inside of waterproofing barrier of the building shall have VOC content equal to or less than the applicable VOC limits.

2.2 MATERIALS AND COMPONENTS

A. General: Materials listed below are not necessarily all-inclusive, nor are all materials listed necessarily required to be used based on final designs and layouts provided by County's Representative.

B. Acrylic Sheet: ASTM D702, Type III.

C. High Molecular Acrylic Sheet: Nevamar "Vitricor," or equal.

D. Vinyl: Opaque non-reflective film with pressure-sensitive adhesive backing, suitable for exterior applications.

E. Mounting Tapes:
   1. Double-sided urethane foam tape, 3M #4016, or equal.
   2. Double-sided acrylic foam: 3M "VHB" Series," or equal.

F. Colored Coatings for Acrylic Plastic Sheet: Use nonfading colored coatings, including inks and paints for copy and background colors, which are recommended by acrylic manufacturer for optimum adherence to surface.

G. Silk-Screen Ink: Opaque enamel; Series 1100 "Sty-Ra-Lac," by Naz-Dar, Matthews Screen "MAP," or equal. Screen materials and methods to be in accordance with manufacturer's specifications.

H. Paint: Follow general requirements of Section 09 90 00 Painting and Coating.
   1. Metallic Paint: Silver based and intended for signage and graphics; Matthews Paint "Proseco" series or equal.

I. Anchors and Inserts: Nonferrous metal or hot-dipped galvanized anchors and inserts as required for corrosion resistance.

J. Adhesive: As recommended by sign manufacturer.

K. Bronze Plate:
   1. Plate: ASTM B36, alloy UNS No. C28000 (Muntz metal, 60 percent copper).
   2. Sand Castings: ASTM B584, alloy UNS No. C83600 (No. 1 manganese bronze).

L. Stainless Steel: Provide stainless-steel plate, sheet, and strip, Type 302 or Type 304, complying with ASTM A666.

M. Aluminum Sheet: ASTM B209, Alloy selected by sign fabricator to meet the structural requirements of the specific application. Surface finish shall be smooth, free of extrusion marks or imperfections.

N. Anchors and Inserts: Nonferrous metal or hot-dipped galvanized anchors and inserts as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors.

2.3 INTERIOR SIGNS

A. Toilet Room Identification:
   1. General: Laminated colored plastic, 1/4 inch thick, core color contrasting with exterior face color and texture; or acrylic plastic with inset symbols.
   2. Plaques:
      a. Men's Toilet:
         1) Door: 12-inch equilateral triangle, vertex pointing up.
         2) Wall Adjacent to Door: Pictogram with international male figure above text descriptor and upper case and Grade 2 Braille lettering. Text and braille shall not be located in pictogram field.
      b. Women's Toilet:
         1) Door: 12-inch-diameter circle.
         2) Wall Adjacent to Door: Pictogram with international female figure above text descriptor and upper case and Grade 2 Braille lettering. Text and braille shall not be located in pictogram field.
      c. Unisex Toilet:
         1) Door: Equilateral triangle mounted on a 12-inch circle.
         2) Wall Adjacent to Door: Both international male and female figures, wheelchair figure, and both upper case and Grade 2 Braille lettering. Text and braille shall not be located in pictogram field.
      d. Unisex Shower: As shown on the Drawings.

B. Elevator Fire Safety Sign: If not provided under Division 14.
   1. Sign Panel Size: 36 square inches in proportion specified by County's Representative.
   2. Layout: Three lines of copy to read as follows:

"In Case of Fire
Do Not Use Elevators
Use Stairs"

C. Maximum Occupancy Signs at Assembly Areas: Minimum 8 inches high x 12 inches wide, larger if required to accommodate text.
   1. Fabrication: Laminated colored plastic, 1/4 inch thick, core color contrasting with exterior face color and texture; or acrylic plastic with inset symbols.
   2. Layout: Copy as indicated on the Drawings, with numbers to be provided by County's Representative.

D. Floor Identification in Stairways:
   1. Fabrication: Laminated colored plastic, 1/4 inch thick, core color contrasting with exterior face color and texture; or acrylic plastic with inset symbols.
   2. Panel Size: As shown on the Drawings.
   3. Layout: In conformance with CBC 1133B.4.3.
   4. Text: To be provided by County's Representative.
   5. Locate at the landing of each Floor level, placed adjacent to the door on the latch side.

E. Exit Signs:
   1. Fabrication: Laminated colored plastic, 1/4 inch thick, core color contrasting with exterior face color and texture; or acrylic plastic with inset symbols.
   2. Panel Size: As shown on the Drawings.
   3. Layout: In conformance with [comply with Section 1117B.5.1 Item 1 Sections 11B-703.1, 11B-703.2, 11B-703.3 and 11B-703.5.
   4. Text: To be provided by County's Representative.

F. Accessible Means of Egress Signs:
   1. Text: To be provided by County's Representative.
   2. Layout: In conformance with CBC Section 1117B.5.1, Items 2 and 3, 11B-703.5 requirements for visual characters. Include the International Symbol of Accessibility complying with Section 11B-703.7.2.1.
   3. Locate at each door to an area of refuge and exterior area for assisted rescue in accordance with Section 1011.4.
   4. Is used in conjunction with a tactile "Exit Stair" sign, the tactile exit sign shall be located closest to the door and the two signs placed side by side.

G. Illuminated Exit Signs: As shown on Drawings and specified in Division 26.

H. Electrical, Mechanical and Other Code Required Room Identification Signs: As indicated on the Drawings.

I. Sign Colors: Except as required by CBC, as scheduled in Product and Finish Schedule on Sheet A7.0; or, if not scheduled, as selected by County's Representative.

2.4 LUMINOUS EGRESS PATH MARKING

A. Manufacturers: EverGlow Photoluminescent Exit Path Markings, American PermaLighting Inc., GlowBrite Photoluminescent Systems, EcoGlo, or equal.

B. Provide photoluminescent markings for steps, landings, handrails, and other items in egress path, as indicated on the Drawings and/or required by IBC / IFC 1024.
   1. Where perimeter demarcation lines are required, use wall-mounted type.
   2. Coordinate with specified emergency egress and exit signage for a complete code compliant installation.

2.5 FABRICATION - GENERAL

A. Fabricate signage to remain flat under installed conditions.

B. Fabricate with smooth, mechanically finished edges. Ease corners slightly.

C. Graphic Elements: All text and symbols shall be sharply distinct and clear.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation, examine site to confirm that all sign locations are as specified and are ready for installation.

3.2 INSTALLATION

A. General:
   1. Use concealed mounting in compliance with manufacturer's instructions.
   2. Install signs level and plumb at height indicated, with sign surfaces free from distortion or other defects in appearance.
   3. Locate signage where shown and scheduled. Where location is not shown, locate as directed by County's Representative or required by code.

B. Plaques: Mount to wall and door surfaces with specified mounting tape.
   1. Mounting Height: 60 inches above floor, unless otherwise shown, specified, or required by code.
   2. Door-Mounted Signs: Center on door.
   3. Wall-Mounted Signs: Mount on latch side of door, except as otherwise shown or specified.

3.3 CLEANING AND PROTECTION

A. At completion of installation, clean soiled surfaces in accordance with the manufacturer's instructions.

B. Protect signage from damage until acceptance by the County.

END OF SECTION 10 14 00

SECTION 10 21 13

PHENOLIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Floor supported overhead braced phenolic toilet partitions.
   2. Wall-mounted phenolic urinal screens.

B. Related Requirements:
   1. Tiling: Section 09 30 00.
   2. Toilet Accessories: Section 10 28 13.
   3. Product and Finish Schedule: Sheet A7.0.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
   3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Each partition layout showing plan, swing of doors, elevation views, anchorage and mounting details, hardware, finishes, and relevant dimensions.

B. Product Data: Manufacturer's data sheets on panel construction, parts list, installation instructions, and maintenance procedures.

C. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 4:
         1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.

2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.

b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

D. Samples:
1. Panel Material: 6 inches square or larger, in selected color(s), showing finished edge and corner.
2. Brackets, Hardware, and Accessories: If requested by County's Representative.

1.4 CLOSEOUT SUBMITTALS

A. Extended warranty.

1.5 WARRANTY

A. Manufacturer: Provide County with manufacturer's written warranty for panels of not less than 15 years. Failure includes but is not limited to corrosion, warpage, breakage and delamination.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. General: Partitions shall be vandal-resistant and moisture-resistant, designed for heavy use and abuse in institutional washrooms.

B. Partition Material:
1. Shall resist delamination under steam, water, or hose down conditions.
2. Shall provide superior non-ghosting graffiti removal, ASTM D6578.
   a. Graffiti Resistance: Passed cleanability test; 5 staining agents.
3. Shall provide superior scratch and dent resistance, ASTM D2197 and ASTM D2794.
   a. Scratch Resistance: Maximum load value exceeds 10 kilograms.
   b. Impact Resistance: Maximum impact force exceeds 30 inch-pounds.
4. Shall provide solid-color clear-through repair ability.
5. Environmental:
   a. Shall include recycled content.
   b. No substances shall be released into atmosphere or water during use or recycling.
6. Fire Resistance: Class B, ASTM E-84.
   a. Smoke Developed Index: Less than 450.

b. Flame Spread Index: Less than 75.

C. Regulatory Requirements:
1. Conform to ANSI A117.1 and ADA for accessibility.
a. Door Width: Provide minimum 32 inch clear door openings when front entry, minimum 34 inch clear door openings when side entry.
b. Spacing: Provide minimum 32 inch clearance between water closet and inside edge of compartment on side away from grab bars, minimum 60 inch clear width, and front space as applicable.
c. Reinforcing: Provide reinforcing for grab bars to be partition mounted.
2. Brace stall partitions to structure as required to meet CBC seismic requirements.

D. Design Requirements:
1. Urinal Screens: Provide minimum 30 inch clear space at urinal.
2. Floor Clearance of Panels between Stalls: To be coordinated with County's Representative.
3. Provide uniform clearances of not over 1/2 inch between wall and panels and between wall and end pilasters.

E. Erection Tolerances:
1. Maximum Variation From True Position: 1/4 inch.
2. Maximum Variation From Plumb: 1/8 inch.

2.2 TOILET COMPARTMENT SYSTEM

A. Partitions: Floor supported, headrail braced.

B. Urinal Screens: Wall hung, bracket supported, vandal resistant.

C. Colors: As selected by County's Representative from manufacturer's standard color range and scheduled in Product and Finish Schedule on Sheet A7.0.

D. Manufacturers and Products:
1. Basis of Design: Yemm & Hart.
2. Acceptable Alternative: "SierraSeries" by Bobrick Washroom Equipment Inc. or Mills "Bradmar" Series by Bradley Corporation.
3. Additional Acceptable Manufacturers and Products: Global Partitions, General Partitions Manufacturing Corp., or equal meeting specified performance criteria.

2.3 COMPONENTS

A. Pilasters and Bases:
1. Provide adjustable pilaster base support with floor anchor plate secured to structural subfloor.
2. Pilaster Shoes: Plinths, one piece, 22 gage, 4 inches high, Type 304 stainless steel, formed to fit pilaster, equipped with concealed clips, and hemmed at top and bottom.

B. Mounting Brackets: 18 gauge stainless steel, extending full height of panel for both toilet partitions and urinal screens.

C. Hardware and Fittings for Standard (Non-Accessible) Compartments: Extra-heavy-duty stainless steel "Institutional Hardware." Provide for each toilet compartment:
   1. Hinges: Three, barrel-type, self-closing, gravity-return movement, adjustable to hold door open.
   2. Latch: Equip for emergency access.
   3. Provide U-shaped pull handle on both sides of door. Mount directly below latch.
   4. Two 11-gage (3 mm) stainless steel door stop plates with attached rubber bumpers, to resist door being kicked in or out beyond stile.
   5. Coat hook on the back of each door.

D. Hardware and Fittings for Accessible Compartments: As specified above, except:
   1. Pulls and latches shall not require tight grasping, pinching, or twisting.
   2. Latch shall be slide or flip-over type.
   3. Mount latch and pull handle not over 40 inches above finish floor.
   4. Maximum Force To Open Door: 5 pounds.

E. Attachments, Screws and Bolts: Stainless steel, tamper proof type, as recommended by partition manufacturer and the following:
   1. Use through-bolted stainless steel hardware to attach panel-to-stile brackets and latch keepers.
   2. Provide factory-installed threaded brass inserts for installing door hinges, door latch, and door stops.
   3. Exposed Bolts and Screws: Theft-resistant, one-way heads, stainless steel, pinhead Torx screws.

F. Headrails: 1-inch x 1-5/8-inch minimum, heavy-duty tubular stainless steel or extruded anodized aluminum, satin finish, anti-grip profile, with cast socket-type wall brackets.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units in accordance with manufacturer recommendations and installation instructions, secure, rigid, plumb, level, and square.

B. Attach panels and pilasters to bracket with through sleeve tamper proof bolts and nuts.

C. Provide uniform clearances of not over 1/2 inch between wall and panels and between wall and end pilasters.

D. Secure panels to walls with continuous wall brackets fastened to solid backing; do not use toggle bolts.

E. Attach panels and pilasters to brackets with tamper-resistant through bolts and nuts.

F. Adjust and align hardware to uniform clearance at vertical edges of doors not exceeding 3/16 inch.

G. Doors shall swing freely.

H. Doors on compartments for the handicapped shall be in-swinging and shall return to closed position.

I. Doors on other compartments shall be in-swinging and shall return to a position 30 degrees from fully closed.

END OF SECTION 10 21 13

SECTION 10 22 10

CHAIN LINK PARTITION AND GATE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Interior chain link fencing with swinging gate.

B. Related Requirements:
   1. Door Hardware: Section 08 71 00; lockset and strike.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.

B. Coordinate with Section 08 71 00 Door Hardware to provide appropriate mounting for keyed locking hardware.

1.3 ACTION SUBMITTALS

A. Shop Drawings:
   1. Plan layout and elevations, drawn to scale of not less than 1/2 inch equals one foot, showing dimensions of partitions; positions of posts, frames, and other components; and positions of doors.
   2. Details of connections with adjacent materials.

B. Product Data: Manufacturer's descriptive literature for products and methods of installation.

C. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 4:
         1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.

2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.

b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

D. Samples:
1. Hinge.
2. Each type of installation hardware, if requested by County's Representative.
3. Where appropriate, approved samples may be installed as part of finished work.

1.4 QUALITY ASSURANCE

A. Materials and installation shall conform to the requirements of the Chain Link Fence Manufacturers Institute (CLFMI) "Product Manual."

B. Installation shall be by the manufacturer or manufacturer's approved installer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:
1. Partitions shall be chain link fence with top rail and bottom rail wire.
2. Height: Full height, floor to ceiling; field verify.

B. Fabric: Galvanized steel wire conforming to CLFMI Class 1.
1. Wire Diameter: 9 gage.
2. Mesh Opening: 2 inches.
3. Edges: Knuckle fabric at top and bottom selvedges.

C. Framework: Posts and rails shall be square or rectangular tube sections finished to match fence fabric.
1. Framework shall be of size and weight to support and accommodate lockset and strike specified in Section 08 71 00 Door Hardware.

D. Gates: Conform to ASTM F900 finished to match fence fabric and posts.
1. Size: 84-inch headroom x 36 inches wide, unless greater size is shown.
2. Hardware:
a. Lockset and strike as specified in Section 08 71 00 Door Hardware.
b. Provide boxes and accessories as required.
c. Provide stops and 3 or more hinges.

E. Fittings: Pressed steel or malleable iron hot-dipped galvanized in conformance with ASTM A153.

F. Tie Wires: Galvanized, 9 gage minimum.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Conform to requirements of ASTM F567 and reviewed submittals.

B. Set all posts straight, plumb, and true to line.
   1. Set terminal posts at corners, ends, and gates.
   2. Posts shall be supported on flanges anchored into concrete slab at top and bottom.
   3. Verify allowable fastener penetration into concrete.
   4. Orient floor flanges and mounting to avoid a tripping hazard.

C. Stretch fabric to proper tension between terminal posts.
   1. Attach fabric to terminal posts by weaving fabric into integral lock loops formed in the post.
   2. Attach fabric to posts using tension bars and bands.
   3. Attach fabric to line posts and top and bottom rails using wire clips of size and spacing recommended by the manufacturer.

D. Verify that gates and hardware operate smoothly and without binding. Adjust as required.

END OF SECTION 10 22 10

SECTION 10 22 19

DEMOUNTABLE WALL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Demountable glazed and solid panel partitions.
   2. Sliding and butt hinged doors and door hardware integral with partition system.
   3. Sound seal ceiling panels.

B. Related Requirements:
   1. Door Hardware: Section 08 71 00; general requirements for door hardware.
   2. Glazing: Section 08 80 00;
      a. Translucent resin glazed partition system.
      b. Applied window film; custom vinyl graphic.
   3. Non-Structural Metal Framing: Section 09 22 16.
   4. Gypsum Board: Section 09 29 00.
   5. Acoustical Ceilings: Section 09 51 00.
   6. Product and Finish Schedule: Sheet A7.0.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
   3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Dimensioned plan, elevations, and details showing proposed layout and assembly of system. Show all components and accessories, including glazing and electric outlets.
   1. Indicate location and installation requirements for door hardware and track, and direction of travel.
   2. Show wall-mounted items and related reinforcements.
   3. Indicate related acoustic ceiling system and lighting layout.
   4. Include wiring diagrams for power and data management wiring installed within system at outlet locations.
   5. Show attachments to adjacent construction.

B. Product Data: Manufacturer's product data for the following system materials suitable to show compliance with requirements.
   1. Each type of board material.
   2. Metal accessories, if other than listed products are to be provided.

C. Samples of components and accessories, if requested by County's Representative.
   1. Provide samples for selection of colors and finishes, where applicable.
   2. Where appropriate, accepted samples will be returned and may be used as part of mockups and finished installation.

D. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 4:
         1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
         2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
         3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
      b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.
      c. Credit EQ 4.4: Composite wood and agrifiber materials manufacturers' product data stating that they contain no added urea-formaldehyde resins.
         1) Include statement indicating costs for each product.

1.4 INFORMATIONAL SUBMITTALS

A. Statement of installer qualifications, if requested by County's Representative.

1.5 CLOSEOUT SUBMITTALS

A. Manufacturer's recommended cleaning and maintenance instructions for dry-erase film and other exposed components.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installer shall be approved by system manufacturer.

B. All materials shall be the products of one manufacturer.

C. Regulatory Requirements: Installed system shall meet CBC seismic requirements.

D. Mockups: First installed example of system or each of its components shall serve as a mockup for review by County's Representative of installation workmanship, visual effect, and interface with adjacent construction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. All materials shall be delivered in their original unopened packages.

B. Store materials protected from damage and exposure to weather.

C. Damaged and deteriorated materials shall be removed from the premises.

D. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Demountable Partition System: Pre-engineered, pre-manufactured coordinated movable wall system consisting of glazed panels, glazed sliding barn doors, and glazed butt hinged panels.
   1. Basis of Design Manufacturer and Product: Dirtt Environmental Solutions, San Francisco, CA, 415-828-5729, or equal.
      a. Products specified and shown on the Drawings are by Dirtt Environmental Solutions, unless otherwise noted.
   2. Panels: 4-inch deep, with facing and glazing as shown.
      a. Height: 9 feet 0 inches.
      b. Finish: Manufacturer's standard powder coating, in color as scheduled in Product and Finish Schedule on Sheet A7.0.
   3. Aluminum Extrusions: ASTM B221 and B308, temper and alloy as selected by manufacturer for intended use.
      a. Finish at Exposed Locations: Manufacturer's standard clear-anodized.
      b. Rectilinear profiles.
   4. Base Trim: Thermoplastic rubber, with a Shore A hardness of 64, plus or minus 5; Santoprene or equal as standard with the manufacturer.
      a. Color: Silver unless otherwise scheduled.
   5. PVC Components: Manufacturer's standard.
      a. Color: As scheduled in Product and Finish Schedule on Sheet A7.0.
   6. Insulation: 1-inch thick, formaldehyde-free fiberglass. Provide at solid panels for enclosed offices.

7. Power and Communications Wiring and Outlets: Quick-connect, pre-tested, factory-built and ready for field installation and connection.
   a. Outlet Locations: As shown.

B. Glass:
   1. For Glass Walls: 10mm clear tempered glass, complying with requirements specified in Section 08 80 00 Glazing.
   2. For Sliding and Butt Hinged Doors: 6mm clear tempered glass, complying with requirements specified in Section 08 80 00 Glazing.
   3. Applied Window Film: As specified in Section 08 80 00 Glazing.

C. Sliding Glass Doors:
   1. Door Design: Style as shown, framed, 4-inch stiles and 10-inch bottom stile.
   2. Door Hardware:
      a. Typical: As standard with manufacturer including sliding door track, track cover and door roller assembly with alignment pin on floor.
      b. Pulls: System manufacturer's standard dummy bar pulls.
         1) Dummy pulls go from top of door down to 10 inches above finish floor on both sides of door.
      c. Locking: Not required.
      d. Pressure required to open doors shall not exceed the maximum pressure allowed by the CBC.

D. Butt Hinged Glass Doors:
   1. Door Design: Style as shown, framed, 4-inch stiles and 10-inch bottom stile.
   2. Door Hardware:
      a. Typical: As standard with manufacturer, including butt hinges.
      b. Pulls: System manufacturer's standard dummy bar pulls and full height bottom locking bar pulls.
         1) Dummy pulls go from top of door down to 10 inches above finish floor on both sides of door.
         2) Locking pulls are full height on pull side of door. Provide dustproof bottom strike.
      c. Locking: Manufacturer's standard interchangeable core lockset prepared to receive cores provided by County.
         1) ADA thumb turns.
         2) Adams Rite or equal.
      d. Door Stops: Trimco 7281 or equal, with 630 finish.
      e. Pressure required to open doors shall not exceed the maximum pressure allowed by the CBC.

EXECUTION

2.2 INSTALLATION

A. Install partitions as shown on the Drawings and as instructed in manufacturer's literature.

B. Securely attach floor and ceiling runners.

C. Accurately plumb at openings and wall terminations.

D. Partitions shall be rigid and plumb, with horizontal lines level, and shall be neat in appearance and free from defects in workmanship.

E. Glazing shall comply with requirements specified in Section 08 80 00 Glazing.

F. Conceal all connections to walls, floors, and ceilings and between adjacent panels.

END OF SECTION 10 22 19

SECTION 10 28 13

TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Contractor furnished and installed toilet, shower, and janitorial accessories.

B. Related Requirements:
1. Joint Sealants: Section 07 92 00.
2. Glazing: Section 08 80 00; unframed mirrors.
3. Non-Structural Metal Framing: Section 09 22 16; metal backing plates.
4. Tiling: Section 09 30 00.
5. Phenolic Toilet Compartments: Section 10 21 13.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

B. Coordination:
1. Coordinate submission of installation instructions so backing, blocking, and framing can be properly installed and work of other trades will not be delayed.
2. Coordinate accessory locations with other work to avoid interference and to ensure proper operation and servicing of accessory units.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Provide setting drawings, templates, instructions, and directions for installation of anchorage devices and cutout requirements in other work.

B. Product Data: Manufacturer's catalog cuts and data sheets, complete parts list, and installation requirements for each accessory item specified.

C. Sustainable Design (LEED):
1. General:
a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
b. Sustainable design submittals are in addition to other submittals.

c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.

2. The following information shall be provided:
   a. Credit MR 4:
      1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
      2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
      3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
   b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

D. Schedule: Indicate type, quantities, sizes, and locations for accessories.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data and operating instructions.

B. Keys for each locking unit.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Meet applicable requirements of CBC and Americans with Disabilities Act Standards (ADAS).

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials in original packaging to prevent soiling, physical damage, or wetting.

B. Protection:
   1. Maintain protective covers until installation is complete.
   2. Remove protective covers at final cleanup of installation.

C. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. Stainless steel products shall have postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.

2.2 TOILET ACCESSORIES

A. Manufacturer: Accessories specified are by Bobrick Washroom Equipment, Inc., as specified and basis of design, except as otherwise noted. Equivalent products by American Specialties, Inc. (ASI), Bradley Washroom Accessories, or equal, may be submitted as substitutions in accordance with Section 01 62 00 Product Options and Substitutions.

B. Schedule:
   1. Recessed Paper Towel Dispenser/Trash Receptacle: Bobrick B-43944.
   2. Framed Mirror: Bobrick B-165, size as indicated on Drawings.
   3. Multi-Toilet Paper Dispenser: Bobrick "Contura" B-4288.
   4. Shelf and mop holder: Bobrick B-239 x 34.
      a. Provide shelf and mop holder at all mop sink locations.
   5. Grab Bars: Bobrick series B6806, size and configuration indicated.
      a. Include hinged grab bars where shown.
   6. Towel Pin: Bobrick B-6777.
   7. Surface Mounted Single Robe Hook: Bobrick #B-6717.
   8. Shower Curtain Rod: Bobrick B-207, length as required for opening.
   9. Shower Curtain Hooks: Bobrick B204-1. Provide one hook for each 6 inches of shower curtain.
   10. Shower Curtain: Bobrick B204-3.
   11. ADA Folding Shower Seat: Bobrick B-5193, length as shown, color to be selected.
   12. Recessed Stainless Steel Shower Niche: Cantrio Koncepts SN-2412 or equal.
      a. Niche shall be leakproof.
      b. Niche shall be tall enough to accommodate a standard sized shampoo bottle.
   13. Baby Changing Station: Koala KB208, as specified and basis of design.
   14. Shelf: Bobrick B-295.
   15. Soap Dispenser: Bobrick B-826.
   16. Surface Mounted Seat Cover Dispenser: Bobrick B-4221.
   17. Surface Mounted Sanitary Napkin Disposal: B-470.
   18. Additional Toilet Accessories: As selected by County's Representative or shown on the Drawings.

2.3 ADDITIONAL MATERIALS AND PRODUCTS

A. Fastenings: As standard with the accessory item manufacturer and as recommended by manufacturer for each substrate.
   1. Provide concealed unless otherwise shown or specified.

2. If not concealed, provide theft-proof type to match accessory item finish.
3. Hot-dip galvanize ferrous metal anchors and fastening devices.

B. Adhesive: Epoxy type contact cement meeting specified sustainable design requirements.

C. Concealed Anchor Plates: Anchor plates for grab bars to be installed at stud walls; Bobrick "Series 256," or equal.

D. Exposed Plumbing Insulation at Lavatories:
1. Type: Molded closed cell vinyl, ADA conforming P-trap and angle valve under sink protective pipe covers.
2. Product: "Lav-Guard" by Truebro, Inc., 800-340-5969, as specified and basis of design, or equal.
3. Finish: Standard white.
4. Provide with required accessories.

2.4 FABRICATION

A. Shop assemble components and package compete with anchors and fittings.

B. Fabricate recessed units with seamless one-piece flange on exposed face.

C. Locked Dispensing Units: Key alike for all accessories.

D. Weld corners, leaving no open miters.

E. Provide mounting hardware appropriate to substrate.

F. Typical Metal Finish: Satin stainless steel.

G. Back paint components where contact is made with building finishes, to prevent electrolysis

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check substrates and recesses for correct dimensions, plumbness of blocking or frames, and preparation and also other conditions that would affect installation of accessories.

B. Verify spacing of plumbing fixtures and toilet partitions that affect installation of accessories.

3.2 INSTALLATION

A. Install accessories in locations and at heights indicated on the Drawings.

B. Install accessories in accordance with manufacturer's recommendations and code accessibility requirements, plumb, true to line, complete with all required fasteners and accessories, securely anchored to backing, blocking, or building structure.

C. Drill holes to correct size. Cut openings for recessed items with 1/4-inch tolerance so that cut is concealed by flange after application of item.

D. Mount recessed accessories into wall openings with wood screws through cabinet side into wood blocking or sheet metal screws into metal blocking or backing.

E. Mount surface-mounted accessories to solid backing or blocking; plumb and align.

F. Trademarks shall not be visible in the finished installation.

G. Sealants: Comply with requirements of Section 07 92 00 Joint Sealants.
   1. Apply behind toilet accessories as necessary to ensure sanitary and watertight integrity of surfaces.
   2. Conceal sealants.

H. Framed Mirrors: Secure to concealed wall hanger in accordance with manufacturer's instructions for theft-resistant mounting.

I. Attach grab bars to backing installed in walls to withstand loads prescribed by CBC.

3.3 ADJUSTMENT AND CLEANING

A. Remove protective coverings in accordance with manufacturer's instructions.

B. Adjust accessories for proper operation.

C. After completion of installation, clean and polish exposed surfaces.

D. Deliver keys and instruction sheets to the County.

END OF SECTION 10 28 13

SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Fire extinguishers, hangers and cabinets.

1.2 SUBMITTALS

A. Product Data: Manufacturer's specifications and installation instructions for extinguishers and cabinets.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."

B. Fire extinguishers shall be listed and labeled for type, rating, and classification by Factory Mutual (FM) or another independent testing agency acceptable to authorities having jurisdiction and to County's insurance company.

C. Meet accessibility requirements for mounting height and projection from wall.

2.2 EQUIPMENT

A. Fire Extinguishers: Multipurpose dry chemical type; 5-pound capacity, UL Rating 42:10BC, by same manufacturer as fire extinguisher cabinets.

B. Recessed Fire Extinguisher Cabinet - Nonrated Partitions: Fully recessed, steel construction.
   1. Cabinet Trim: Flat.
   2. Door: Vertical window with acrylic glass.
   3. Latching: Zinc-plated pull handle with self-adjusting roller catch.
   4. Door Hardware: Continuous hinge permitting door to open 180 degrees.
   5. Finish: Shop prime with white baked enamel.

C. Mounting Brackets for Surface-Mounted Extinguishers: Manufacturer's standard for extinguisher specified.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cabinets and extinguishers where required by the fire department of the relevant jurisdiction and in coordination with the County's Representative.
   1. Assume one extinguisher per 75-foot radius (maximum 75-foot travel distance from any given point to an extinguisher).
   2. Provide bracket-mounted extinguishers where shown.
   3. Provide recessed cabinets in stud walls.
   4. Provide fire extinguisher in each cabinet.

B. Inspect, charge, and tag the fire extinguishers within 10 days before the Substantial Completion date.

END OF SECTION 10 44 00

SECTION 11 31 00

RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Contractor furnished and installed "Energy Star" rated appliances.

B. Related Requirements:
1. Architectural Wood Casework: Section 06 41 00.
2. Rough-in and Connection of Plumbing, Mechanical, and Electrical Services as Required for Operation: Divisions 22, 23, and 26.
3. Product and Finish Schedule: Sheet A7.0.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

B. Coordination:
1. Coordinate sequence of installation with work of other Sections.
2. Coordinate location and placement of utilities for appliances and equipment.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Details required for installation of appliances if not shown on manufacturer's standard product data for utility rough-in connections, clearances, and relationship to adjacent construction and casework.

B. Product Data: Manufacturer's catalog cuts of equipment with model numbers and optional accessories to be provided clearly marked.

1.4 CLOSEOUT SUBMITTALS

A. Service agreement.

B. Guarantee and warranty certificates, including manufacturer's operating and maintenance instructions.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer for installation and maintenance of units required for this Project.

B. Regulatory Requirements: Comply with the following:
   1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. ANSI: Provide gas-burning appliances that comply with ANSI Z21 Series standards.

C. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

1.6 WARRANTY

A. Special Warranties: Manufacturer's standard form in which manufacturer of appliances agrees to repair or replace residential appliances or components that fail in materials or workmanship within a 2-year warranty period.

PART 2 - PRODUCTS

2.1 GENERAL

A. Where model numbers scheduled are not current, provide equal features on a current model as acceptable to County.

B. The color of all appliances will be stainless steel, except as otherwise noted.

C. Selected appliances shall be Energy Star Rated, where available.

D. Appliances are listed in Product and Finish Schedule on Sheet A7.0.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.

C. Examine walls, ceilings, and roofs for suitable conditions where exhaust vents will be installed.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written instructions.

B. Built-in Equipment:
   1. Securely anchor units to supporting cabinets or countertops with concealed fasteners.
   2. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.

C. Freestanding Equipment:
   1. Place units in final locations after finishes have been completed in each area.
   2. Verify that clearances are adequate to properly operate equipment.

D. Utilities: Comply with plumbing and electrical requirements.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:
   1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
   2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
   3. Operational Test: After installation, start units to confirm proper operation.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

C. An appliance will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train County's maintenance personnel to adjust, operate, and maintain appliances.

END OF SECTION 11 31 00

SECTION 12 24 00

WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Window shades.
   1. Manually operated, single light filtering fabric.
   2. Electrically operated, single light filtering fabric.
   3. Electrically operated, room darkening filtering fabric.
   4. Electrically operated, dual shade system.

B. Related Requirements:
   1. Aluminum-Framed Storefronts: Section 08 43 13.
   2. Electrical: Division 26.
   3. Product and Finish Schedule: Sheet A7.0.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
   3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

1.3 ACTION SUBMITTALS

A. Shop Drawings:
   1. Submit for each mounting condition and each location, showing brackets, anchorage to substrate, and relationship to adjacent materials.
   2. Show field-measured dimensions of openings scheduled to receive shades.
   3. Submit detailed wiring diagrams. Include each component of the system with a detailed list of the components, wiring schematics, and operational characteristics for every level of operation.

B. Product Data: Manufacturer's descriptive literature of controls, accessories, attachment brackets, and installation instructions.

C. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.

c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.

2. The following information shall be provided:
   a. Credit MR 4:
      1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
      2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
      3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
   b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

D. Samples: 12-inch square of each shade material.

1.4 INFORMATIONAL SUBMITTALS

A. Installer qualifications.

1.5 CLOSEOUT SUBMITTALS

A. Furnish for inclusion in Owner's Operations and Maintenance Manual two copies of manufacturer's recommended maintenance procedures for each type of shade, control, and two sets of any special tools that are required.

B. Extended warranties.

1.6 QUALITY ASSURANCE

A. Qualifications:
   1. Installer: Employee of shade manufacturer or certified in writing by manufacturer as an acceptable installer of shade system.
   2. Manufacturer: Continuously engaged in manufacturing commercial window shades of the types required for not less than 10 years prior to date of this Contract.

B. Turn-Key Single-Source Responsibility for Window Shade Systems: To control responsibility for performance of window shade systems, assign the design, engineering, and installation of window shade systems, motors, controls, and electrical wiring specified in this Section to a single manufacturer and their authorized dealer/installer. The County's Representative will not produce a set of electrical drawings for the installation or wiring of the motors or controls for the motorized window shades. The Contractor shall coordinate the following with the window shade manufacturer:
   1. Power and panel boxes of sufficient size to accommodate window shade manufacturer's requirements, as required and as indicated on the Electrical Drawings.
   2. Conduit as required for window shade electrical wiring. Coordinate requirements with window shade manufacturer before inaccessible areas are constructed.
   3. Line voltage and low-voltage wiring from the base line distribution panel in each area to all motors and low voltage wiring to the central-control location. All above-ceiling and concealed wiring shall be plenum-rated or installed in conduit.
   4. Conduit in areas which might not be accessible to the window-shade contractor due to the building design or equipment.

C. Mockup: Install window shade mockup at one location for each type of shade to show full operation and appearance. Coordinate location with County's Representative.

1.7 WARRANTY

A. Manufacturer's Warranties:
   1. Tracks, gear-and-sprocket mechanism, and accessories for shades shall be warranted for 5 years against defects in materials and workmanship which inhibit proper and intended functioning of products.
   2. Ten year warranty for shadecloth with the provision that it will not deteriorate, sag or warp and will remain fit for use for the full warranty period.
   3. Motors shall be warranted to be free of defects in manufacture for 4 years.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE REQUIREMENTS

A. Drive Assembly:
   1. Shall be factory set for size and travel of shades.
   2. Shall be adjustable from exterior of shade unit without disassembly of hardware.
   3. Shall have a built-in shock absorber system to prevent chain breakage under normal usage conditions.

B. Removal of shade shall not require disassembly of shade unit.

C. Shade Cloth:
   1. Shade cloth shall hang flat, without buckling or distortion.
   2. Edge, when trimmed, shall hang straight without raveling.

3. An unguided roller shade cloth shall hang true and straight, without shifting sideways more than 1/8 inch in either direction due to warp distortion or weave design.
4. Flame Retardance: Shade fabric shall be certified by an independent testing laboratory to pass NFPA 701 and applicable code requirements.

D. Each shade shall fully cover the opening where it occurs.

E. Shades shall have no seams, except where approved in advance in writing by County's Representative.

F. Source Limitations:
1. The system shall be furnished by a single-source supplier with a certification that all components including motor, shade fabrics, electrical controls, and override controls have been designed and tested as a compatible system and will be available in the future for either replacement or add-on requirements.
2. Each type of shadecloth shall be woven of the same yarns, have similar weaves, and shall be color matched by dye lot.
3. Furnish shadecloth of the same dye lot for each area.

G. Where more than one shade occurs in a pocket, locate chains for manually operated shades on same side of pocket.

H. Sustainable Design:
1. Provide materials with the highest levels of post-consumer and pre-consumer recycled content.
2. When available, provide materials extracted, harvested, recovered and manufactured within 500 miles of the project site.

2.2 SHADES

A. Acceptable Manufacturers: MechoShades Systems Inc., Solarfective Product Ltd., 416-421-3800 as distributed by D. Zelinsky & Sons, Brisbane, CA; Lutron Electronics; Crestron; or equal.
1. All products, including hardware, accessories, mounting brackets, trim, and fastenings, shall be from the same manufacturer.
2. Products specified and scheduled as Basis of Design are by MechoShades Systems Inc.

B. Types: Hand chain and motorized. Coordinate location of motor operated units with County's Representative.

C. Configurations: Single shade and dual shade systems, top down.

D. Where more than one shade occurs in a pocket, locate chains for shades on same side of pocket.

2.3 MATERIALS AND COMPONENTS

A. Shade Material:
   1. Fabric(s): As scheduled in Product and Finish Schedule on Sheet A7.0.
   2. Transparency: 5 percent open.
   3. Colors: Custom and different interior and exterior side, as scheduled in Product and Finish Schedule on Sheet A7.0.

B. Fascia: Extruded aluminum with specified custom paint finish. Secure without exposed fasteners.

C. Hembar:
   1. Extruded aluminum with plastic end finials.
   2. Aluminum Finish: As specified.

D. Drive Assembly at Manual Shades: Factory set for size and travel of shades.
   1. Capable of field adjustment from the exterior of the shade unit without disassembling the hardware.
   2. Provided with a built-in shock absorber system to prevent chain breakage under normal use conditions.

E. Chain at Manual Shades: 90 pound test, No. 10 stainless steel bead chain formed in a continuous loop.

F. Miscellaneous Brackets, Fastenings, and Accessories: As detailed, or if not detailed, as recommended by shade manufacturer for conditions indicated on the Drawings or encountered.

2.4 POWER OPERATOR

A. Motor: Fractional horsepower asynchronous motor with reversible capacitor designed for intermittent operation.
   1. Power: 95-125V AC, 60 HZ, single phase.
   2. Thermally protected, temperature Class A, totally enclosed.
   3. Solenoid activated disk brake mechanism to stop and hold shade in any position, and externally adjustable internal limit switches. Brake shall automatically disengage when motor is operating.
   4. Electrical Components: CSA and UL listed.
   5. Motor shall be concealed within the shade tube and shall be maintenance free.
   6. Controller: Manufacturer's "Smart Operating System" group controller.

B. Switching: As shown on the Drawings.

C. Controls: Provide 3-position rocker-type wall switch where indicated on the Drawings; switch and switch plate to match other switches provided under Division 26.

2.5 FABRICATION

A. Workmanship: Fabricate shades in accordance with manufacturer's specifications and as detailed, complete with accessories necessary for specified operation.

B. Coordinate special pocket closure trim as shown on the Drawings with fabrication of aluminum window wall and window framing.

C. Factory Finish on Exposed Aluminum: Polyvinylidene fluoride paint system using "Kynar 500"/"Hylar 5000" resin.
   1. Color: Custom, to match framing of adjacent windows or window wall, unless otherwise scheduled.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and openings to receive shades and conditions under which they are to be installed.

3.2 INSTALLATION

A. Install shades in accordance with manufacturer's installation instructions.
   1. Mount in pockets and enclosures as shown on the Drawings.
   2. Assure adequate clearance to permit unencumbered operation.
   3. Position units plumb and true, and securely anchor in place with brackets, clips, and fasteners.

B. Each shade shall extend the full height and width of the window opening where it occurs.

C. Coordinate motor-operated shade installation with requirements included in Division 26.

3.3 ADJUSTMENT AND CLEANING

A. Verify operation. Adjust clearances to ensure free operation.

B. Remove protective coverings and devices.

C. Clean soiled shade surfaces and components.

D. Replace damaged items with new material.

END OF SECTION 12 24 00

SECTION 12 36 23

PLASTIC LAMINATE COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Plastic laminate faced counters and splashes.

B. Related Requirements:
1. Architectural Wood Casework: Section 06 41 00.
2. Joint Sealants: Section 07 92 00.
3. Product and Finish Schedule: Sheet A7.0.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Prepare for each countertop in accordance with Section 1 Article entitled "Submittals" of the NAAWS document referenced below.
1. Show items interfacing with countertops including relationship to supporting casework. Identify materials to be used.
2. Shop drawings for countertops may be submitted as part of shop drawings prepared and submitted under Section 06 41 00 Architectural Wood Casework.

B. Sustainable Design (LEED):
1. General:
a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
b. Sustainable design submittals are in addition to other submittals.
c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
2. The following information shall be provided:
a. Credit MR 4:
1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.

3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.

b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

c. Credit EQ 4.1:
   1) Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for field-applied adhesives and sealers used inside of the weatherproofing barrier of the building demonstrating compliance with SCAQMD Rule #1168.
   2) Manufacturer's product data for aerosol adhesives used inside of the weatherproofing barrier of the building, including printed statement of VOC content that demonstrates compliance with the limits defined in Green Seal Standard GS-36.

d. Credit EQ 4.4: Composite wood and agrifiber materials manufacturers' product data stating that they contain no added urea-formaldehyde resins.
   1) Include statement indicating costs for each product.

C. Samples: 8 by 10-inch piece of each selected pattern and color of plastic laminate.

1.4 QUALITY ASSURANCE

A. Standard for Materials and Workmanship: Comply with Section 11, "Countertops," and applicable requirements of Appendix A of the "North American Architectural Woodwork Standards (NAAWS)," Edition 1 published jointly by WI and AWMAC and all current revisions (hereinafter also referred to as the "woodworking standard"). Where Contract Documents indicate requirements that conflict with or augment the woodworking standard, comply with the conflicting or augmenting requirements.

B. Fabricator Qualifications: Active member of WI or AWI. Other fabricators will be considered for approval upon submission of verifiable evidence of experience in successful completion of work similar to work of this Project.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver products until wet work, painting, and similar operations in storage and installation areas which could damage or soil work have been completed.

B. Coordinate delivery with fabrication and installation of supporting casework.

C. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

PART 2 - PRODUCTS

2.1 PLASTIC MATERIALS

A. High-Pressure Plastic Laminate: Conforming to NEMA LD3.1 and ISO 4586-2.

B. Grades:
1. Horizontal Surfaces and Backsplash: ISO 10/HGS; horizontal, general purpose.
2. Postforming, if Required: ISO 12/HGP; horizontal, general purpose, postformable.
3. Backing Sheet: ISO 91/BKL; backer, light duty.

C. Manufacturers, Colors, and Patterns: As scheduled in Product and Finish Schedule on Sheet A7.0.

2.2 PANEL MATERIALS

A. Particle Board: 3/4 inch thick, conforming to ANSI A208.1, Grade M2 and acceptable to laminate manufacturer.

B. Plywood Substrate and Supports: 5/8-inch-thick continuous plywood, to be provided for mounting of countertops by casework fabricator.

2.3 ACCESSORIES

A. Fasteners: Type and size as required.

B. Adhesive for High Pressure Plastic Laminate: Phenol, resorcinol, or melamine base, VOC compliant.

2.4 FABRICATION

A. Obtain field measurements and verify dimensions before fabricating work.

B. Comply with NAAWS Custom Grade requirements and ANSI A161.2.

C. Fabricate to dimensions, profiles, and details indicated on the Drawings.

D. Return substrate and plastic laminate at bottom edge of self-edged countertops.

E. Joint seams shall be balanced and centered, as applicable. Do not locate seams at sink cutouts.

F. To greatest extent possible, complete fabrication and assembly before shipment to site.
1. Disassemble components only as necessary for shipment and installation.
2. Where necessary for fitting at site, provide extra borders and edges so as to allow scribing and trimming to fit.

G. Precut openings for applied fixtures and fitting, where possible. Field cuts shall be performed by the fabricator.

H. Conceal all fasteners.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that backing has been installed at appropriate locations for anchorage.

B. Examine shop-fabricated work for completion. Complete work as required.

3.2 INSTALLATION

A. Rough Tops:
   1. Install rough tops to accommodate the correct countertop size and ready to receive countertop materials.
   2. Underside of tops exposed-to-view, including overhangs, shall be a finished plywood sheet, plugged, and sanded, and finished as directed by the County's Representative.

B. Install countertops in accordance with Section 11 of the NAAWS standard and requirements shown on the Drawings.

C. Make joints neatly, with uniform appearance.

D. Install work plumb, level, true, and straight, with no distortions. Install with no variation in flushness of adjoining surfaces.

E. Shim as required, using concealed shims.

F. Scribe and cut to fit adjoining work.

G. Sealant: Install sealant as specified in Section 07 92 00 Joint Sealants as required to close any small unavoidable gaps between counter and abutting surfaces. Sealant shall not be a substitute for tightly scribed work.

END OF SECTION 12 36 23

SECTION 12 36 61

SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Precast terrazzo countertops, with matching splashes.
2. Recycled polyester countertops, with matching splashes where indicated.

B. Related Requirements:
1. Metal Fabrications: Section 05 50 00.
2. Miscellaneous Rough Carpentry: Section 06 10 53; rough support framing.
3. Architectural Wood Casework: Section 06 41 00.
4. Joint Sealants: Section 07 92 00.
5. Plumbing: Division 22.
6. Product and Finish Schedule: Appendix A.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

1.3 ACTION SUBMITTALS

A. Shop Drawings:
1. Dimensioned, to-scale plans and elevations showing details of fabrication, seams, edging, lavatory or sink installation, fastener types and locations, sealant, and method of attachment.
2. Identify color and pattern of solid surfacing for each location and type.
3. Coordinate preparation of shop drawings with casework interfacing with solid surfacing countertops.

B. Product Data: Manufacturer's descriptive literature and test reports substantiating that solid surfacing meets specified requirements.

C. Sustainable Design (LEED):
1. General:
a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.

b. Sustainable design submittals are in addition to other submittals.
c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.

2. The following information shall be provided:
   a. Credit MR 4:
      1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
      2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
      3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
   b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.
   c. Credit EQ 4.1: Manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for field-applied adhesives and sealers used inside of the weatherproofing barrier of the building demonstrating compliance with SCAQMD Rule #1168.

D. Samples:
   1. Minimum 6-inch-square piece of each pattern and color.
   2. Counter edge of each profile to be used, 6-inches long.

1.4 INFORMATIONAL SUBMITTALS

A. Statement of fabricator qualifications.

B. Evidence of certification of installer by manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Extended warranty.

B. Manufacturer's recommended care and maintenance recommendations including recommended repair and cleaning instructions.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Certified by manufacturer of solid surfacing as an acceptable fabricator and installer.

B. Mockup: First installed countertop assembly of each countertop material, to include sink and backsplash where applicable, shall serve as a mockup for review by County's Representative of workmanship, visual effect, and interface with adjacent construction. Coordinate with other Sections for a complete installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver products until wet work, painting, and similar operations in storage and installation areas which could damage or soil work have been completed.

B. Store in racks in near-vertical position away and from direct exposure to sun. Store with finished face toward finished face.

C. Comply with additional requirements specified in Section 01 43 00 Quality Assurance - Materials and Equipment and in Section 01 65 00 Delivery, Storage and Handling.

1.8 WARRANTY

A. Provide manufacturer's extended 10-year warranty against defects in materials, fabrication, and installation. Warranty shall provide material and labor to repair or replace defective materials.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:
   1. Solid surfacing materials shall conform to ANSI/CPA SS-1.
   2. Slabs shall be sized to minimize number of joints in installation.

B. Precast Terrazzo Solid Surfacing: "Tectura" by Wausau, or equal.
   1. Thickness: 1-1/4 inches.
   2. Profile, Pattern, Color Mix, and Surface Treatment: As scheduled in Product and Finish Schedule on Sheet A7.0.

C. Recycled Polyester Solid Surfacing: Homogeneous, thermoset, polymer alloy sheet; "Alkemi" by Renewed Materials, LLC, or equal.
   1. Thickness: 1/2 inch, unless greater thickness is shown or scheduled.
   2. Color and Surface Treatment: As scheduled in Product and Color Schedule on Sheet A7.0.

2.2 ACCESSORIES

A. Mounting Adhesive: Structural-grade silicone or epoxy of type recommended by manufacturer for application and conditions of use.

B. Panel Joint Adhesive: Manufacturer's standard two-part epoxy or polyester to create flush, inconspicuous, monolithic, non-porous joints with a chemical bond.

C. Sealant: Silicone; type as recommended by solid surfacing manufacturer.

D. Mounting Hardware:
   1. For Fixtures: Manufacturer's approved bowl clips, brass inserts, and fasteners.
   2. For Surfacing: Type and size as required and recommended by surfacing manufacturer.

2.3 FABRICATION

A. Comply with applicable requirements of ISSFA-2 and printed instructions of manufacturer including those for treating cut edges, sanding, polishing, seaming and layering.

B. Obtain field measurements, and verify dimensions before fabricating work.

C. Fabricate to dimensions, profiles, and details indicated on the Drawings.
   1. Use a single piece wherever possible. Where multiple sheets are required, use sheets in consecutive order as numbered by manufacturer.
   2. Precut openings for applied fixtures and fittings, where possible. Cutouts shall be smooth and uniform without saw marks.
   3. Predrill mountings for applied hardware, where possible.
   4. Conceal all fasteners.

D. To greatest extent possible, complete fabrication and assembly before shipment to site.
   1. Disassemble components only as necessary for shipment and installation.
   2. Where necessary for fitting at site, provide extra borders and edges to allow scribing and trimming to fit.

E. Provide joints only where maximum available lengths or countertop configuration requires a joint.
   1. Install joints where shown on reviewed shop drawings, in accordance with manufacturer's instructions.
   2. Joints shall be hard seamed. Provide 2-inch-wide seam blocks under seams in accordance with manufacturer's recommendations.
   3. Seal seams with specified joint adhesive, clamp tightly, and sand smooth.
   4. Finished joints shall be flush, monolithic, uniform, and nearly invisible.

F. Fabricate countertops with integral front edge with profile shown on the Drawings, and with small-radius coved back and end splashes.

G. Allowable Tolerances:
   1. Variation in Component Size: Plus or minus 1/4 inch.
   2. Location of Openings: Plus or minus 1/4 inch from indicated position.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that backing has been installed at appropriate locations for anchorage.

B. Examine shop-fabricated work for completion. Complete work as required.

3.2 INSTALLATION

A. Install countertops in accordance with manufacturer's recommended installation procedures, as shown on reviewed submittals, to match accepted mockups.
   1. Set tops on supports.
   2. Anchor using fasteners shown on reviewed shop drawings.

B. If field joints are required, make them in same manner as shop joints. Finished joints shall be flush, monolithic, uniform, and nearly invisible.

C. Scribe and cut to fit adjoining work.

D. Install work plumb, level, true, and straight, with no distortions. Install with no variation in flushness of adjoining surfaces. Shim as required, using concealed shims.

E. Sealant: Use silicone sealant to attach back and end splashes, and to seal joints around plumbing fixtures.

F. Install sealant as specified in Section 07 92 00, "Joint Sealants," as required to close any small unavoidable gaps between counter and abutting surfaces. Sealant shall not be used to correct excessive joint size or scribing errors.

3.3 ADJUSTMENT, CLEANING, AND PROTECTION

A. Repair damaged and defective work to eliminate visual and functional defects. Where repair is not possible, replace work.

B. Clean exposed surfaces.

C. Protect installed work from damage.

END OF SECTION 12 36 61

SECTION 12 48 13

ENTRANCE FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Interior recessed mat and aluminum frame.

B. Related Requirements:
1. Portland Cement Underlayment: Section 03 54 15.
2. Tiling: Section 09 30 00.
3. Product and Finish Schedule: Sheet A7.0.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.
3. Closeout Submittals shall be submitted in accordance with Section 01 77 00 Contract Closeout and Section 01 78 36 Warranties.

B. Coordination:
1. Coordinate top surface of mats with doors that swing across the mat surface to ensure proper clearances.
2. Coordinate frame installation and detailing with Section 03 54 15 Portland Cement Underlayment and Section 09 30 00 Tiling.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Show layout and installation details of mats and frames for each location.

B. Product Data: Manufacturer's descriptive literature for mat and frame. Include recommended installation and maintenance instructions.

C. Sustainable Design (LEED):
1. General:
a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
b. Sustainable design submittals are in addition to other submittals.

c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.

2. The following information shall be provided:
   a. Credit MR 4:
      1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
      2) Statement or vendor's invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
      3) Cut sheets or manufacturer's technical data sheet indicating levels of recycled content for each material having recycled content.
   b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

D. Samples: Frame and each mat, in suitable size to demonstrate construction, appearance, color, and finish.

1.4 CLOSEOUT SUBMITTALS

A. Cleaning and maintenance data.

B. Warranty as specified.

1.5 WARRANTY

A. Manufacturer: Exterior mat and frames shall be warranted by the manufacturer for 10 years against defects in materials and installation.

PART 2 - PRODUCTS

2.1 INTERIOR ENTRANCE MAT AND FRAME

A. Walk-Off Mat: As scheduled in Product and Finish Schedule on Sheet A7.0.
   1. Material: Roll goods of 100 percent natural coco fiber with vinyl backing.
   2. Thickness: 5/8 inch.
   3. Color: As scheduled.

B. Frame: Recessed extruded aluminum angle with top flush with finished floor surface.
   1. Height: As required for specified mat thickness.
   2. Frame shall have mitered and welded corners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set recessed frames prior to placement of tile flooring.

B. Install frames with drilled in anchors.

C. Set top of frame flush with top of adjacent finish floor.

D. Fit mats neatly into recess with correctly aligned edges.

END OF SECTION 12 48 13

SECTION 12 93 13

INTERIOR BICYCLE RACKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Interior floor-mounted bicycle racks.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:
   1. Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 Submittal Procedures.
   2. Sustainable Design (LEED) Submittals shall comply with the additional requirements of Section 01 35 13.23 LEED™ Requirements.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Plans, elevations, and details showing layout and anchorage.

B. Product Data: Manufacturer's descriptive literature, construction drawings, and installation instructions.

C. Sustainable Design (LEED):
   1. General:
      a. Submit information necessary to establish and document compliance with the LEED Certification goals for this Project.
      b. Sustainable design submittals are in addition to other submittals.
      c. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance.
   2. The following information shall be provided:
      a. Credit MR 4:
         1) Product data indicating percentage by weight of pre-consumer and post-consumer recycled content for each product having recycled content.
         2) Statement or vendor’s invoice indicating costs for each product having recycled content. Indicate relative dollar value of recycled content product to total dollar value of products included in the project.
         3) Cut sheets or manufacturer’s technical data sheet indicating levels of recycled content for each material having recycled content.
      b. Credit MR 5: Statement of cost on a line-item basis and statement that the distance from place of extraction, harvest, recovery and manufacture to project site is within 500 miles and indicate relative dollar value of regional material product to total dollar value of products included in the project.

PART 2 - PRODUCTS

2.1 BICYCLE RACKS

A. Bicycle Racks: "Ultra Space Saver" system by Dero Bike Racks; or equal.
   1. Provide assemblies of 5 and 8 racks as shown.
   2. Provide optional tire stop.
   3. Finish: Powder coat in color to be selected by County's Representative from manufacturer's standard colors.
   4. Anchors: Stainless steel, as recommended by manufacturer for secure anchorage to concrete.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install racks anchored to concrete as shown, using stainless steel anchors.

END OF SECTION 12 93 13

SECTION 21 13 00

FIRE SUPPRESSION SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and the following other Sections, apply to work of this Section.

B. Where items from the referenced Codes and Standards are repeated in this Specification, it is intended to call attention to them. It is not intended that other parts of the referenced Codes and Standards shall be assumed to be omitted if not repeated in this Specification.

C. Include all labor, material, equipment and service necessary for, and reasonably incidental to the complete design, coordination, procurement, fabrication, and installation of the automatic fire sprinkler system modifications and additions necessary for compliance with National Fire Protection Association (NFPA) 13, *Standard for the Installation of Sprinkler Systems,* and the requirements of the City of Oakland, California.

D. It is the intent of these specifications to describe the complete wet pipe sprinkler system additions and modifications. The Contractor is responsible for carefully and critically reviewing the contract plans, specifications, and site conditions to the extent and as far as practicable. Any case of error, omission, discrepancy or lack of clarity shall be promptly identified to the County's Representative for clarification.

E. In general, work shall include, but not be limited to:
   1. The detailed design, coordination, fabrication, procurement, and installation of the complete fire sprinkler system additions and modifications as required for compliance with NFPA 13 and the requirements of the City of Oakland, California.
   2. Demolition and proper disposal of existing fire sprinkler system piping and appurtenances as necessary.
   3. Installation of flexible connections and seismic bracing.
   4. All penetrations through walls, floors and ceilings necessary for the installation of the fire sprinkler system additions including the installation of approved firestop assemblies necessary to maintain the designed fire resistance rating of the wall, ceiling, or floor assembly.
   5. Systems and device testing.
   6. "As Built" fire sprinkler documentation to reflect the complete fire protection system installation (existing piping and changes/additions).
   7. All necessary permits and fees.
   8. 5-Year system testing and certification of each building fire protection system in accordance with Title 19 and the California Edition of NFPA 25 *Standard for*

the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.

F. The Contractor shall be responsible for establishing and implementing all safety programs and procedures for this project and shall comply with all Federal, State and Local Safety and Health Regulations.

G. Fire sprinklers shall be aesthetically located in suspended ceilings, and to the extent feasible, shall be generally aligned with other ceiling features and fixtures, and other nearby fire sprinklers.
   1. In 2x4 ceiling tiles, fire sprinklers shall be located in the "center-of-tile", or the "quarter-point".
   2. In 2x2, or 1x1 ceiling tiles, fire sprinklers shall be located in the "center-of-tile".
   3. Installation tolerance from "center-of-tile" or "quarter-point" shall be 1/2-inch ±.

H. The 393 13th Street Renovation project will be served by revised and expanded fire sprinkler systems in accordance with NFPA 13 for all areas of the building. Each fire sprinkler system will be supplied from the existing firewater service connection, fire department connection, and combination standpipe system. Refer to the Architectural Project Drawings for additional area-specific fire sprinkler requirements. Fire protection system modifications and additions, by level/area, will generally consist of, but not be limited to, the following:
   1. Basement
      a. Removal of the existing fire sprinklers, drops, and armovers serving the current finished-ceiling sprinklers. Existing branchlines and crossmains are anticipated to be re-used with relatively minor modification (e.g. rotate piping outlets for new sprinklers, provide plugs, etc.).
      b. Provide new pendent sprinklers (including new drops/armovers) for the new/replacement ceilings. Sprinkler locations, types, and finishes to be carefully coordinated with Architectural requirements for alignment and integration into the proposed ceiling types.
      c. Provide sidewall sprinklers in the “Vault” in accordance with NFPA 13. Sprinkler locations, types, finishes, and configurations to be carefully coordinated with Architectural requirements for alignment and integration into the proposed ceiling types.
      d. Provide branchline pipe restraints for all existing, and proposed new piping in accordance with the requirements of NFPA 13 (2016).
      e. Analyze existing fire sprinkler seismic bracing locations and connections. Revise existing and/or provide new seismic bracing for compliance with NFPA 13 (2016).
      f. Resolution of Corrective Items Noted in July 2016 5-Year Inspection Report;
         1) Back Lift Room: Rework (1) Obstructed Head, extend w/ 401 Trim (6" Surface mounted Light)
         2) Imaging, Clean Supply Room: Reattached (1) Hanger outside the Room
         3) Replace (2) Gauges at Riser Dated 2010

4) Gas Room: Replace (1) Loaded 200° QR BR SSU
5) Under Staircase: Add (1) Head Cage to SSP
6) Basement Stairway: Mixed Temperature Heads, 155° & 200°

2. 1st Floor
   a. Removal of the existing fire sprinklers, drops, and armovers serving the current finished-ceiling sprinklers. Existing branchlines and crossmains are anticipated to be re-used with relatively minor modification (e.g. rotate piping outlets for new sprinklers, provide plugs, etc.).
   b. Provide new branchlines and sprinklers for the new mezzanine expansion between Column Line 7 and 8. Piping to be closely coordinated with structural and architectural constraints for beam penetrations and architectural features. Connect new branchlines to the existing 3-inch crossmain along Column Line G.
   c. Provide new pendent sprinklers (including new drops/armovers) for the new/replacement ceilings. Sprinkler locations, types, and finishes to be carefully coordinated with Architectural requirements for alignment and integration into the proposed ceiling types.
   d. Provide branchline pipe restraints for all existing, and proposed new piping in accordance with the requirements of NFPA 13 (2016).
   e. Analyze existing fire sprinkler seismic bracing locations and connections. Revise existing and/or provide new seismic bracing for compliance with NFPA 13 (2016).
   f. Resolution of Corrective Items Noted in July 2016 5-Year Inspection Report;
      1) Restroom Area: In Hard Lid Replace (1) Painted 155° QR CH SSP
      2) Women's Restroom: Replace (2) Painted 155° QR CH SSP' s
      3) Men's Restroom: Replace (2) Painted 155° QR CH SSP’ s, (1) is in the Closet
      4) Small Closet: Replace (1) Painted 155° QR CH SSP
      5) Replace (2) Painted 155° QR CH SSP' s in nooks far right corner of the Room
      6) Replace (2) Riser Gauges Dated 2010
3. Mezzanine and High Ceiling of Lobby
   a. Removal of the existing pre-action fire sprinkler system serving the existing Computer Room. Retain and return equipment and devices to the County for possible re-use.
   b. Removal of the existing fire sprinklers, drops, and armovers serving the current finished-ceiling sprinklers between Column Line 2 & 8 and F & G. Existing branchlines and crossmains are anticipated to be re-used with relatively minor modification (e.g. rotate piping outlets for new sprinklers, provide plugs, etc.).
   c. Provide new pendent sprinklers (including new drops/armovers) for the new/replacement ceilings. Sprinkler locations, types, and finishes to be carefully coordinated with Architectural requirements for alignment and integration into the proposed ceiling types.

d. To the extent feasible in areas where the existing ceilings have been removed for this Project, provide branchline pipe restraints for all existing, and proposed new piping in accordance with the requirements of NFPA 13 (2016).
    1) It is not the intent of this Project to modify the fire sprinkler piping in the high ceiling area, or to add seismic restraints or bracing in the high ceiling area.
e. To the extent feasible in areas where the existing ceilings have been removed for this Project, analyze existing fire sprinkler seismic bracing locations and connections. Revise existing and/or provide new seismic bracing for compliance with NFPA 13 (2016).
f. Resolution of Corrective Items Noted in July 2016 5-Year Inspection Report;
    1) In the high ceiling area, replace (60+/-) Recalled GB4 155° QR CH SSP Concealed Heads.
    2) Replace (2) Gauges at Riser Dated 2010
    3) Stairway: Replace (1) Painted 155° QR CH SSP
    4) 2nd Room off Elevator: Add (1) Head Cage
    5) Staircase: Replace (2) Recalled Heads w/ White Concealed Trim

4. 2nd Floor
    a. Removal of the existing fire sprinklers, drops, and armovers serving the current finished-ceiling sprinklers generally between Column Lines 1 & 2, between E & F, and between A & B (where new ceiling assemblies are proposed). Existing branchlines and crossmains are anticipated to be re-used with relatively minor modification (e.g. rotate piping outlets for new sprinklers, provide plugs, etc.).
    b. Provide new pendent sprinklers (including new drops/armovers) for the new/replacement ceilings. Sprinkler locations, types, and finishes to be carefully coordinated with Architectural requirements for alignment and integration into the proposed ceiling types.
    c. To the extent feasible in areas where the existing ceilings have been removed for this Project, provide branchline pipe restraints for all existing, and proposed new piping in accordance with the requirements of NFPA 13 (2016).
    d. To the extent feasible in areas where the existing ceilings have been removed for this Project, analyze existing fire sprinkler seismic bracing locations and connections. Revise existing and/or provide new seismic bracing for compliance with NFPA 13 (2016).
    e. Resolution of Corrective Items Noted in July 2016 5-Year Inspection Report;
        1) Outside Elevator: Replace (1) Painted 155° QR CH SSP
        2) Stairway: Replace (1) Painted 155° QR CH SSP, Lower (1) Head and Replace (1) Missing Trim
        3) Replace (2) Gauges at Riser Dated 2010
        4) Blue Hard Lid: Replace (2) Painted/Corroded 155° QR CH SSP's

5) Blue Hard Lid on the back Left of MT: Replace (1) 2PC Trim, and lower (1) Head
6) Women's Restroom: Replace (1) Painted 155° QR CH SSP
7) MT Office to the Right of Extinguishers: Replace (1) 2PC CH Trim
8) Office next to Water Fountain: Replace (1) 2PC CH Trim
9) Men's Restroom: Rework (1) Head that is too Low, and inspect for Possible Leak

5. 3rd Floor
   a. Provide new pendent sprinkler (including new drops/armovers) for the new/replacement ceiling at the elevator lobby.
   b. To the extent feasible in areas where the existing ceilings have been removed for this Project, provide branchline pipe restraints for all existing, and proposed new piping in accordance with the requirements of NFPA 13 (2016).
   c. To the extent feasible in areas where the existing ceilings have been removed for this Project, analyze existing fire sprinkler seismic bracing locations and connections. Revise existing and/or provide new seismic bracing for compliance with NFPA 13 (2016).
   d. Resolution of Corrective Items Noted in July 2016 5-Year Inspection Report;
      1) Hard Lid Heads: Replace (4) Painted 155° QR CH SSP' s
      2) Right Side of Sink: Replace (1) Corroded 155° QR CH SSP
      3) Men's Restroom: Replace (1) Painted 155° QR CH SSP
      4) Replace (2) Gauges at Riser Dated 2010
6. Class 1 Standpipe System and Firewater Supply System
   a. Resolution of Corrective Items Noted in July 2016 5-Year Inspection Report;
      1) All Hose Valves are Missing Signage for Wet Standpipe (10)- Replace all
      2) Add (12) 2 1/2" Gasket for Hose Valves on Every Floor
      3) Add 911 Bell Signs outside Staircase on the 13th St. Side Add (1) 5x7 Sign for Back Flow
      4) Add hydraulic calculation nameplates and data for each of the fire sprinkler systems.
      5) Provide break-away lock and chain to existing backflow assembly.

1.2 RELATED SECTIONS

A. General Requirements

1.3 DRAWINGS

A. The available/provided "As Built" fire sprinkler and standpipe drawings are diagrammatic only. Contractor shall determine the actual measurements and make any and all such length and offset adjustments as may be necessary at no change in the contract price. The Drawings are not intended to relieve the Contractor of any responsibility for avoiding conflicts or obstructions, or for installing the number of

sprinklers and supply piping as required to provide complete protection of the designated areas in accordance with the requirements of the referenced standards and these specifications.

1.4 QUALITY ASSURANCE

A. Equipment: All new/modified equipment shall be new, and Listed by Underwriters' Laboratories or Approved by Factory Mutual.

B. Contractor Qualification: The Contractor shall California licensed C-16 Fire Protection Contractor experienced in the installation of similar automatic fire protection systems.

1.5 REFERENCES

A. General: System, equipment, installation, and materials and methods used shall comply with the following standards:
   1. Applicable requirements of the City of Oakland, California.
   2. National Fire Protection Association (NFPA) 13, *Standard for the Installation of Sprinkler Systems* 2016 Edition, as adopted by the California Building and Fire Codes.
   3. California Building and Fire Codes.
   4. Manufacturer's recommendations and guidelines.

1.6 SUBMITTALS

A. Submit the following in accordance with the General requirements:
   1. Working Plans as described in NFPA 13, shall be submitted within 30 days after the award of the contract. Installation shall not begin until approval has been received. Electronic files of the Contract Drawings will be provided for the Contractor’s use in developing the detailed shop drawings for this project upon request. All drawings prepared by the Contractor shall be developed using CAD computer-aided drafting (AutoCAD or compatible). Installation shall not begin until approval has been received.
   2. Shop Drawings: Submit seven prints of each shop drawing. Minimum allowable sheet size is 8-1/2 x 11-in.
   3. Product Data: Within 15 days after the award of the contract, submit for approval seven copies of manufacturer's literature, wiring diagrams, etc., for each piece of equipment used in the system. If the manufacturer's catalog sheets show more than one item, the items proposed for use shall be identified.
   4. Record Drawings: Provide Record Drawings of the completed installation. Record Drawings shall reflect the existing “As Built” fire sprinkler plans, field-verified and updated by the Contractor as necessary, and shall reflect the additional fire sprinklers and piping provided under this scope of work.
   5. Operation and Maintenance Manuals: Update existing Operation and Maintenance Manuals as necessary to include documentation on the additional fire sprinklers, materials, and appurtenances provided under this scope of work.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished by the Contractor shall be new, first grade standard, current products of a manufacturer regularly engaged in the production of such materials and equipment. Where two or more pieces of equipment performing the same function are required, they shall be the product of one manufacturer and exact duplicates.

2.2 PIPING, FITTINGS, AND SPECIALTIES

A. Piping shall be new, designed for 175 PSI working pressure, conforming to ASTM specifications, and have the manufacturer's name or brand along with the pipe applicable ASTM standard marked on each length of pipe.

B. Piping 2 inch diameter and smaller shall be Schedule 40 black steel pipe. Pipe shall be manufactured in accordance with specifications ASTM A 135 and A 53.

C. Piping 2-1/2” and larger shall be Schedule 10 black steel pipe manufactured in accordance with specification ASTM A 135.

D. Other thin-walled piping materials (such as Schedule 5, XL and BLT threadable thinwalls, etc.) will not be permitted.

E. All fire protection system piping shall be provided with factory applied antimicrobial coatings to inhibit Microbiologically Influenced Corrosion (MIC). Allied Tube and Conduit "ABF II", Wheatland Tube Company "MIC Shield", or equal.

F. Schedule 40 black steel pipe shall be joined by screwed joints in accordance with specification ANSI B 1.20.1 - 1983 (ANSI/ASME B 2.1), by welded joints in accordance with specification ANSI/ASME B 31.1, Chap. 5, or by UL - listed mechanical grooved couplings. Grooves may be rolled or cut and they shall be dimensionally compatible with the couplings.

G. Schedule 10 black steel pipe shall be joined by welded joints in accordance with specification ANSI/ASME B 31.1, Chap. 5, or by UL-listed mechanical grooved couplings. Grooves shall be rolled and shall be dimensionally compatible with the couplings.

H. Sprinkler piping and fittings exposed to weather, used in a corrosive atmosphere, or as noted on drawings shall be galvanized.

I. Threaded fittings shall be Class 125 cast iron, black, and in accordance with ANSI B 16.4, or ductile or malleable iron, 150 lb. class, black, and in accordance with ANSI B 16.3. Screwed joints shall be made up with approved Teflon joint compound or tape.

J. Flanged fittings shall be cast iron, short body, Class 125, black, and in accordance with ANSI B 16.1. Gaskets shall be full-face of 1/8-in. minimum thickness red sheet rubber. Flange bolts shall be hexagon head machine bolts with heavy

semi-finished hexagon head nuts, cadmium plated, having dimensions in accordance with ANSI B 18.2.

K. Welded fittings shall be steel, standard weights, black, and in accordance with ANSI B 16.9, ANSI B 16.25, ASTM A 234, ANSI B 16.5, and ANSI B 16.11.

L. Grooved couplings and mechanical fittings shall be UL listed or FM approved for fire protection service. Plain-end type pipe fittings and couplings shall not be used. Snap-On and Strapless Outlet fittings shall not be permitted.

2.3 VALVES

A. All new drain valves and test valves shall have replaceable rubber or composition discs.

2.4 SPRINKLERS

A. New fire sprinklers shall be UL Listed, and selected to match/coordinate with the existing sprinklers to the extent feasible (finish, response type and temperature rating).

B. Replacement concealed fire sprinklers for the high-ceiling lobby areas shall be UL Listed Quick Response, with thread-on coverplates. Coverplate finish(es) to be approved by the County's Representative.

C. Extra sprinklers in the quantities required by NFPA 13, cabinets, and wrenches shall be supplied and delivered to the County.

PART 3 - EXECUTION

3.1 GENERAL

A. Ream all piping to remove all burrs. Pipe sections shall be cleaned inside to remove all chips and foreign materials prior to making joints.

B. Install hangers, flexible connections, swing joints, and seismic bracing in accordance with NFPA 13.

C. Seismic brace load calculations shall be in accordance with NFPA 13 (2016 Edition).

D. New system piping shall be installed such that no joints, fittings or devices occur directly over electrical equipment. New fire sprinkler piping shall not be installed in Dedicated Electrical Spaces as defined in the California Electrical Code.

E. Install permanent valve identification signs and hydraulic nameplate data as required by NFPA 13. Signs shall be attached by chain or other durable means.

3.2 PRODUCT HANDLING

A. Deliver materials and store on site in original containers with seals unbroken and labels intact until time of use, in accordance with the manufacturer's instructions.

B. All materials and equipment shall be carefully handled at all times. Only suitable and proper equipment and appliance shall be used for the safe loading, hauling, unloading, handling, and installation of material.

C. All sprinklers shall be protected during installation with the protective cover provided by the manufacturer. The protective cover shall not be removed until all construction which creates a potential for damage to the sprinkler is completed, including but not limited to mechanical equipment and duct, electrical equipment and conduit, plumbing equipment and piping, wall and ceiling construction, etc.

3.3 JOB CONDITIONS

A. Other trades will be working in the building during the contract period. Coordinate work schedule, material deliveries etc. with the County's Representative.

B. Impairments of existing fire protection systems shall be minimized, coordinated with the County's Representative, and performed in accordance with NFPA 25 (California Edition). All existing fire protection systems shall be restored to service at the end of each working day.

C. The work performed on this Project occurs within an existing building. All equipment and material to be furnished and installed on the Project shall be coordinated with space constraints. All equipment and material shall be fabricated such that complete systems may be broken down into sections suitable for lifting and fitting through passageways without modification to the building unless otherwise noted.

3.4 PENETRATIONS

A. The Contractor shall be responsible for all openings and penetrations.

B. Cutting structural members for passing of piping or pipe hanger fastenings will not be permitted except with approval of the Project Structural Engineer. Penetrations of ventilation ducts and similar equipment for the through-passage of piping shall not be permitted.

C. Suitable means shall be provided at each hole or penetration to maintain the designed fire resistance rating of the wall, ceiling or floor assembly.

D. Install split wall plates or escutcheons where exposed piping passes through a finished floor, wall or ceiling. They shall fit snugly around piping. The finish of escutcheons or wall plates shall match the color of adjacent walls, ceilings or floors.

3.5 PAINTING

A. All exposed piping, conduit, valves etc. will be painted by others. Clean all exposed surfaces of oil, dirt, etc. to the Countys Representative's satisfaction.

B. Remove protective bags and wrappings after painting is completed. All sprinklers, which have any paint on them, shall be replaced. Cleaning of painted sprinklers is not permitted.

3.6 FIELD QUALITY CONTROL

A. Upon completion of installation and while piping is still exposed, hydrostatically test the systems at 200 psi (or 50 psi in excess of the system working pressure, whichever is greater) for a period of 2 hours. Any drop in pressure or any leak shall be cause to fail the test and a new test shall be scheduled once repairs are made. A minimum of seventy-two hours notice shall be given to the Project Manager and the Authorities Having Jurisdiction prior to any inspection. The contractor shall have all equipment necessary for the inspection available to the Authorities Having Jurisdiction, including a ladder of an appropriate height.

B. A pre-installation inspection of pipe, fittings, and devices is required.

C. The Contractor shall be responsible for all leaks in new and existing piping.

3.7 GUARANTEE

A. Except as otherwise expressly provided in the Contract Documents, and excepting only items of routine maintenance, ordinary wear and tear and unusual abuse or neglect, Contractor guarantees all work executed by him and all supplies, materials and devices of whatsoever nature incorporated in, or attached to the work, or otherwise delivered to the County's Representative as part of the work pursuant to the Contract, to be absolutely free of all defects of workmanship and materials for a period of one year after final acceptance of the entire work by the County's Representative.

END OF SECTION 21 13 00

SECTION 22 05 01

PLUMBING GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS`

A. For the following plumbing system components and requirements see Division 23 (HVAC/Mechanical) of this specification:
   1. Section 23 05 13 - Common Motor Requirements for HVAC Equipment
   2. Section 23 05 16 - Expansion Fittings and Loops for HVAC Piping
   3. Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment
   4. Section 23 05 53 - Identification for HVAC Piping and Equipment
   5. Section 23 07 19 - HVAC Piping and Equipment Insulation

1.2 LEAD FREE POTABLE WATER SYSTEM

A. All plumbing components including but not limited to pumps, pipe, valves, faucets, strainers, backflow preventers and other wetted parts shall comply with California AB-1953.

END OF SECTION 22 05 01

SECTION 22 05 13

COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
   1. Motor controllers.
   2. Torque, speed, and horsepower requirements of the load.
   3. Ratings and characteristics of supply circuit and required control sequence.
   4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. All motors shall be NEMA Premium Efficiency.

B. Comply with NEMA MG 1 unless otherwise indicated.

C. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Premium efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.
   1. For motors with 2:1 speed ratio, consequent pole, single winding.
   2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Multispeed Motors: Separate winding for each speed.

F. Rotor: Random-wound, squirrel cage.

G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

H. Temperature Rise: Match insulation rating.

I. Insulation: Class F.

J. Code Letter Designation:
   1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
   2. Motors Smaller than 15: HP: Manufacturer's standard starting characteristic.

K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
   1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
   2. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
   3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
   4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
   1. Permanent-split capacitor.

2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 22 05 13

SECTION 22 05 17

SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Sleeves.
   2. Stack-sleeve fittings.
   3. Sleeve-seal systems.
   4. Sleeve-seal fittings.
   5. Grout.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Advance Products & Systems, Inc.
   2. CALPICO, Inc.
   3. Metraflex Company (The).
   4. Pipeline Seal and Insulator, Inc.
   5. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
   1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

2.3 SLEEVE-SEAL FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. HOLDRITE.

B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
   1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
   1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
   2. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.
   1. Cut sleeves to length for mounting flush with both surfaces.
   2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
   3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 07 92 00 "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 07 84 13 "Penetration Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

3.4 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:
   1. Exterior Concrete Walls above Grade:
      a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves or Sleeve-seal fittings.
      b. Piping NPS 6 and Larger: Galvanized-steel wall sleeves or Galvanized-steel-pipe sleeves.

2. Exterior Concrete Walls below Grade:
    a. Piping Smaller Than NPS 6: Sleeve-seal fittings.
        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
    b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system, Galvanized-steel wall sleeves with sleeve-seal system, or Galvanized-steel-pipe sleeves with sleeve-seal system.
        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
3. Concrete Slabs-on-Grade:
    a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves with sleeve-seal system or Sleeve-seal fittings.
        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
4. Concrete Slabs above Grade:
    a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves or Sleeve-seal fittings.
5. Interior Partitions:
    a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

END OF SECTION 22 05 17

SECTION 22 05 18

ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Escutcheons.
   2. Floor plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

C. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

D. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange.

B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.
   1. Escutcheons for New Piping:
      a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

b. Chrome-Plated Piping: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
f. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
g. Bare Piping in Equipment Rooms: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.

2. Escutcheons for Existing Piping:
a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.
b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge.
c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.
f. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed hinge.
g. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with concealed hinge.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
1. New Piping: One-piece, floor-plate type.
2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 22 05 18

SECTION 22 05 19

METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Liquid-in-glass thermometers.
2. Thermowells.
3. Dial-type pressure gages.
4. Gage attachments.
5. Test plugs.
6. Test-plug kits.
7. Sight flow indicators.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Sustainable Design Submittals:
1. Product Data: Metering devices and components.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage, from manufacturer.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:
1. Standard: ASME B40.200.
2. Case: Cast aluminum; 7-inch nominal size unless otherwise indicated.
3. Case Form: Adjustable angle unless otherwise indicated.
4. Tube: Glass with magnifying lens and blue or red organic liquid.
5. Tube Background: Non-reflective aluminum with permanently etched scale markings graduated in deg F.
6. Window: Glass.
7. Stem: Aluminum and of length to suit installation.
a. Design for Thermowell Installation: Bare stem.

8. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 THERMOWELLS

A. Thermowells:
   1. Standard: ASME B40.200.
   2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
   3. Material for Use with Copper Tubing: CNR or CUNI.
   4. Material for Use with Steel Piping: CRES.
   5. Type: Stepped shank unless straight or tapered shank is indicated.
   6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
   7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
   8. Bore: Diameter required to match thermometer bulb or stem.
   9. Insertion Length: Length required to match thermometer bulb or stem.
   10. Lagging Extension: Include on thermowells for insulated piping and tubing.
   11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.3 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
   1. Standard: ASME B40.100.
   2. Case: Liquid-filled type(s); cast aluminum or drawn steel; 6-inch nominal diameter.
   3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
   4. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
   5. Movement: Mechanical, with link to pressure element and connection to pointer.
   6. Dial: Non-reflective aluminum with permanently etched scale markings graduated in psi.
   7. Pointer: Dark-colored metal.
   8. Window: Glass.
   9. Ring: Metal.
   10. Accuracy: Grade B, plus or minus 2 percent of middle half of scale range.

2.4 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Brass ball, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

2.5 TEST PLUGS

A. Description: Test-station fitting made for insertion into piping tee fitting.

B. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

C. Thread Size: NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe thread.

D. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

E. Core Inserts: EPDM self-sealing rubber.

2.6 TEST-PLUG KITS

A. Furnish one test-plug kit(s) containing one thermometer(s), one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

B. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F.

C. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch diameter dial and probe. Dial range shall be at least 0 to 200 psig.

D. Carrying Case: Metal or plastic, with formed instrument padding.

2.7 METERING

A. Meters capable of the following:
   1. Recording daily water consumption.
   2. Communicating data remotely.
   3. Electronic data storage for five years.
   4. Reports showing daily, monthly, and annual water consumption.
   5. Alarming capability in accordance with Water User Efficiency Plan for Operation.

B. Meter potable and reclaimed water sources to the building and onsite non-potable water sources individually.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

G. Install valve and snubber in piping for each pressure gage for fluids.

H. Install test plugs in piping tees.

I. Install thermometers in the following locations:
   1. Inlet and outlet of each water heater.

J. Install pressure gages in the following locations:
   1. Building water service entrance into building.
   2. Inlet and outlet of each pressure-reducing valve.
   3. Suction and discharge of each domestic water pump.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

A. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each domestic water heater shall be **one of** the following:
   1. Liquid-filled, bimetallic-actuated type.
   2. Industrial-style, liquid-in-glass type.
   3. Test plug with EPDM self-sealing rubber inserts.

B. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F.

B. Scale Range for Domestic Hot-Water Piping: 0 to 250 deg F.

3.6 PRESSURE-GAGE SCHEDULE

A. Pressure gages at discharge of each water service into building shall be one of the following:
   1. Liquid-filled, direct-mounted, metal case.
   2. Test plug with EPDM self-sealing rubber inserts.

B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be one of the following:
   1. Liquid-filled, direct-mounted, metal case.
   2. Test plug with EPDM self-sealing rubber inserts.

C. Pressure gages at suction and discharge of each domestic water pump shall be one of the following:
   1. Liquid-filled, direct-mounted, metal case.
   2. Test plug with EPDM self-sealing rubber inserts.

3.7 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Water Service Piping: 0 to 160 psi.

B. Scale Range for Domestic Water Piping: 0 to 160 psi.

END OF SECTION 22 05 19

SECTION 22 05 23.12

BALL VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Bronze ball valves.

1.2 DEFINITIONS

A. CWP: Cold working pressure.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of valve.
   1. Certification that products comply with NSF 61 Annex G.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, and soldered ends.
   3. Set ball valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:
   1. Maintain valve end protection.
   2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
   1. ASME B1.20.1 for threads for threaded end valves.
   2. ASME B16.1 for flanges on iron valves.
   3. ASME B16.5 for flanges on steel valves.

4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
5. ASME B16.18 for solder-joint connections.
6. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 Annex G for valve materials for potable-water service.

D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Actuator Types:
1. Gear Actuator: For quarter-turn valves NPS 4 and larger.
2. Handlever: For quarter-turn valves smaller than NPS 4.

H. Valves in Insulated Piping:
1. Include 2-inch stem extensions.
2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
3. Memory stops that are fully adjustable after insulation is applied.

2.2 BRONZE BALL VALVES

A. Two-Piece, Bronze Ball Valves with Full Port, and Bronze or Brass Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Conbraco Industries, Inc.
b. Crane; Crane Energy Flow Solutions.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.

2. Description:
a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: Two piece.
d. Body Material: Bronze.
e. Ends: Threaded and soldered.
f. Seats: PTFE.
g. Stem: Bronze or brass.
h. Ball: Chrome-plated brass.

i. Port: Full.

2.3 STEEL BALL VALVES

A. Class 150, Steel Ball Valves with Full Port:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Conbraco Industries, Inc.
      b. Jamesbury; Metso.
      c. NIBCO INC.
   2. Description:
      a. Standard: MSS SP-72.
      b. CWP Rating: 285 psig.
      c. Body Design: Split body.
      d. Body Material: Carbon steel, ASTM A 216, Type WCB.
      e. Ends: Flanged or threaded.
      f. Seats: PTFE.
      g. Stem: Stainless steel.
      h. Ball: Stainless steel, vented.
      i. Port: Full.

2.4 IRON BALL VALVES

A. Class 125, Iron Ball Valves:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Valve, Inc.
      b. Conbraco Industries, Inc.
      c. KITZ Corporation.
   2. Description:
      a. Standard: MSS SP-72.
      b. CWP Rating: 200 psig.
      c. Body Design: Split body.
      d. Body Material: ASTM A 126, gray iron.
      e. Ends: Flanged or threaded.
      f. Seats: PTFE.
      g. Stem: Stainless steel.
      h. Ball: Stainless steel.
      i. Port: Full.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install valve tags. Comply with requirements in Section 22 05 53 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

B. Select valves with the following end connections:
   1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
   2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
   3. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
   4. For Steel Piping, NPS 5 and Larger: Flanged ends.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:
   1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
   2. Two-piece, bronze ball valves with full port and bronze or brass trim.

B. Pipe NPS 2-1/2 and Larger:
   1. Steel and Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
   2. Class 150, steel ball valves with full port.
   3. Class 150, iron ball valves.

END OF SECTION 22 05 23.12

SECTION 22 05 23.14

CHECK VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Bronze swing check valves.
   2. Iron swing check valves.
   3. Iron, grooved-end swing check valves.

1.2 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene-diene terpolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of valve.
   1. Certification that products comply with NSF 61 Annex G.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, grooves, and weld ends.
   3. Set check valves in either closed or open position.

B. Use the following precautions during storage:
   1. Maintain valve end protection.
   2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
   1. ASME B1.20.1 for threads for threaded end valves.
   2. ASME B16.1 for flanges on iron valves.
   3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
   4. ASME B16.18 for solder joint.
   5. ASME B31.9 for building services piping valves.

C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

D. NSF Compliance: NSF 61 Annex G for valve materials for potable-water service.

E. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

F. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

G. Valve Sizes: Same as upstream piping unless otherwise indicated.

H. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE SWING CHECK VALVES

A. Class 125, Bronze, Swing Check Valves with Bronze Disc:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Valve, Inc.
      b. Hammond Valve.
      c. NIBCO INC.
   2. Description:
      a. Standard: MSS SP-80, Type 3.
      b. CWP Rating: 200 psig.
      c. Body Design: Horizontal flow.
      d. Body Material: ASTM B 62, bronze.
      e. Ends: Threaded or soldered. See valve schedule articles.
      f. Disc: Bronze.

B. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Valve, Inc.
      b. Hammond Valve.
      c. NIBCO INC.
   2. Description:
      a. Standard: MSS SP-80, Type 4.

b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded or soldered. See valve schedule articles.
f. Disc: PTFE.

2.3 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Hammond Valve.
   b. Milwaukee Valve Company.
   c. Nibco Inc.
2. Description:
   a. Standard: MSS SP-71, Type I.
   b. CWP Rating: 200 psig.
   c. Body Design: Clear or full waterway.
   d. Body Material: ASTM A 126, gray iron with bolted bonnet.
   e. Ends: Flanged or threaded. See valve schedule articles.
   f. Trim: Bronze.
   g. Gasket: Asbestos free.

B. Class 125, Iron Swing Check Valves with Nonmetallic-to-Metal Seats:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Crane; Crane Energy Flow Solutions.
   b. Stockham; Crane Energy Flow Solutions.
2. Description:
   a. Standard: MSS SP-71, Type I.
   b. CWP Rating: 200 psig.
   c. Body Design: Clear or full waterway.
   d. Body Material: ASTM A 126, gray iron with bolted bonnet.
   e. Ends: Flanged or threaded. See valve schedule articles.
   f. Trim: Composition.
   g. Seat Ring: Bronze.
   h. Disc Holder: Bronze.
   i. Disc: PTFE.
   j. Gasket: Asbestos free.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:
   1. Swing Check Valves: In horizontal position with hinge pin level.

F. Install valve tags. Comply with requirements in Section 22 05 53 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:
   1. Pump-Discharge Check Valves:
      a. NPS 2 and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
      b. NPS 2-1/2 and Larger for Domestic Water: Iron swing check valves with lever and weight or spring; or iron, center-guided, metal-seat or resilient-seat check valves.
      c. NPS 2-1/2 and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.

B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

C. End Connections:
   1. For Copper Tubing, NPS 2 and Smaller: Threaded or soldered.
   2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged or threaded.
   3. For Copper Tubing, NPS 5 and Larger: Flanged.

3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller: Bronze swing check valves, Class 125, bronze or nonmetallic disc with soldered or threaded end connections.

B. Pipe NPS 2-1/2 and Larger:
   1. Iron swing check valves, Class 125, metal or nonmetallic-to-metal seats with flanged end connections.

END OF SECTION 22 05 23.14

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Pipe positioning systems.
8. Equipment supports.

B. Related Sections:
1. Section 05 50 00 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 22 05 16 "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.
3. Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment for vibration isolation devices.

1.2 DEFINITIONS

A. MSS: Manufacturers Standardization Society of the Valve and Fittings Industry Inc.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Signed and sealed by a qualified professional Civil or Structural engineer licensed in the State of California. Show fabrication and installation details and include calculations for the following; include Product Data for components:
   1. Trapeze pipe hangers.
   2. Metal framing systems.
   3. Fiberglass strut systems.
   4. Pipe stands.
   5. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Detail fabrication and assembly of trapeze hangers.
   2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.6 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
   3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
   4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
   5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:
   1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
   2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allied Tube & Conduit; a part of Atkore International.
      b. B-line, an Eaton business.
      c. Flex-Strut Inc.
      d. Thomas & Betts Corporation; A Member of the ABB Group.
      e. Unistrut; Part of Atkore International.
      f. Wesanco, Inc.
   2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
   3. Standard: MFMA-4.
   4. Channels: Continuous slotted steel channel with inturned lips.
   5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
   6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
   7. Metallic Coating: Hot-dipped galvanized.

B. Non-MFMA Manufacturer Metal Framing Systems:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Anvil International.
      b. Empire Industries, Inc.
      c. ERICO International Corporation.
      d. Haydon Corporation.
      e. NIBCO INC.
      f. PHD Manufacturing, Inc.
      g. PHS Industries, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Coating: Zinc.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Carpenter & Paterson, Inc.
   2. Clement Support Services.
   3. ERICO International Corporation.
   4. National Pipe Hanger Corporation.
   5. PHS Industries, Inc.
   6. Pipe Shields Inc.
   7. Piping Technology & Products, Inc.
   8. Rilco Manufacturing Co., Inc.
   9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig, ASTM C 552, Type II cellular glass with 100-psig, or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:
   1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
   2. Base: Stainless steel.
   3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
   4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand:
   1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
   2. Bases: One or more; plastic.
   3. Vertical Members: Two or more protective-coated-steel channels.
   4. Horizontal Member: Protective-coated-steel channel.
   5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.7 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.8 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.9 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
   1. Properties: Nonstaining, noncorrosive, and nongaseous.
   2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
   1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
   2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:
   1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:
   1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
   2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 07 72 00 "Roof Accessories" for curbs.

G. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

H. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

K. Install lateral bracing with pipe hangers and supports to prevent swaying.

L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

M. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

O. Insulated Piping:
   1. Attach clamps and spacers to piping.
      a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
      b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
      c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
   2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
   3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
   4. Shield Dimensions for Pipe: Not less than the following:
      a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
      b. NPS 4: 12 inches long and 0.06 inch thick.
      c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers, and metal framing systems and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
   2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
   3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
   4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
   5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
   6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.

7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
   2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
   2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
   3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
   4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
   5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
   2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
   3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
   4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
   5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
   6. C-Clamps (MSS Type 23): For structural shapes.
   7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
   8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
   9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
   10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
   11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
   12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
      a. Light (MSS Type 31): 750 lb.
      b. Medium (MSS Type 32): 1500 lb.
      c. Heavy (MSS Type 33): 3000 lb.
   13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
   14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
   15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
   2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
   3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
   2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
   3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
   4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
   5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
   6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
   7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
   8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
      a. Horizontal (MSS Type 54): Mounted horizontally.
      b. Vertical (MSS Type 55): Mounted vertically.
      c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

R. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

S. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 22 05 29

SECTION 22 05 48

VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Elastomeric isolation pads.
2. Resilient pipe guides.
3. Elastomeric hangers.
4. Restraint channel bracings.
5. Restraint cables.
6. Seismic-restraint accessories.
7. Mechanical anchor bolts.
8. Adhesive anchor bolts.

B. Related Requirements:
1. Section 23 05 48 "Vibration and Seismic Controls for HVAC" for devices for HVAC equipment and systems.

1.2 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-restraint component required.
   a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an evaluation service member of ICC-ES.
   b. Annotate to indicate application of each product submitted and compliance with requirements.
3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

B. Shop Drawings:
   1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment.

C. Delegated-Design Submittal: For each vibration isolation and seismic-restraint device.
   1. Include design calculations and details for selecting vibration isolators and seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional Civil or Structural engineer licensed in the State of California responsible for their preparation.
   2. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, due to seismic forces required to select vibration isolators, and due to seismic restraints.
   3. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system was examined for excessive stress and that none exists.
   4. Seismic-Restraint Details:
      a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
      b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
      c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
      d. Preapproval and Evaluation Documentation: By an evaluation service member of ICC-ES or OSHPD, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of vibration isolation device installation and seismic bracing for plumbing piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.

B. Qualification Data: For professional engineer and testing agency.

C. Welding certificates.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:
   1. Site Class as Defined in the IBC: Refer to Structural Drawings and Specifications.
   2. Assigned Seismic Use Group or Building Category as Defined in the IBC: Refer to Structural Drawings and Specifications.
      a. Component Importance Factor: Refer to Structural Drawings and Specifications.
      b. Component Response Modification Factor: Refer to Structural Drawings and Specifications
      c. Component Amplification Factor: Refer to Structural Drawings and Specifications.
   3. Design Spectral Response Acceleration at Short Periods (0.2 Second): Refer to Structural Drawings and Specifications.
   4. Design Spectral Response Acceleration at 1.0-Second Period: Refer to Structural Drawings and Specifications.
   5. Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of ICC-ES or OSHPD.
      a. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they are subjected.

2.2 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:
   1. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
   2. Size: Factory or field cut to match requirements of supported equipment.
   3. Pad Material: Oil and water resistant with elastomeric properties.
   4. Surface Pattern: Waffle pattern.
   5. Infused nonwoven cotton or synthetic fibers.
   6. Load-bearing metal plates adhered to pads.
   7. Sandwich-Core Material: Resilient and elastomeric.
      a. Surface Pattern: Waffle pattern.
      b. Infused nonwoven cotton or synthetic fibers.

2.3 PIPE-RISER RESILIENT SUPPORT

A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch-thick neoprene.
   1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
   2. Maximum Load Per Support: 500 psigon isolation material providing equal isolation in all directions.

2.4 RESILIENT PIPE GUIDES

A. Description: Telescopic arrangement of two steel tubes or post and sleeve arrangement separated by a minimum 1/2-inch-thick neoprene.
   1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.5 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:.
   1. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
   2. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.6 RESTRAINT CHANNEL BRACINGS

A. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.7 RESTRAINT CABLES

A. Restraint Cables: ASTM A 492 stainless-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.8 SEISMIC-RESTRAINT ACCESSORIES

A. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or Reinforcing steel angle clamped to hanger rod.

B. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.

C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.9 MECHANICAL ANCHOR BOLTS

A. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.10 ADHESIVE ANCHOR BOLTS

A. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ICC-ES or OSHPD.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Division 03.

B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

C. Comply with requirements in Section 07 72 00 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

D. Equipment Restraints:
   1. Install seismic snubbers on plumbing equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
   2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
   3. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES that provides required submittals for component.

E. Piping Restraints:
   1. Comply with requirements in MSS SP-127.
   2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
   3. Brace a change of direction longer than 12 feet.

F. Install cables so they do not bend across edges of adjacent equipment or building structure.

G. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES that provides required submittals for component.

H. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

I. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

J. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

K. Drilled-in Anchors:
   1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
   2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
   3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
   4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
   5. Set anchors to manufacturer's recommended torque, using a torque wrench.
   6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 22 11 16 "Domestic Water Piping" for piping flexible connections.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:
   1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
   2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
   3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
   4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
   5. Test to 90 percent of rated proof load of device.
   6. Measure isolator restraint clearance.
   7. Measure isolator deflection.
   8. Verify snubber minimum clearances.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

END OF SECTION 22 05 48

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Valve tags.
5. Warning tags.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:
1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Letter Color: Per ASME 13.1.
3. Background Color: Per ASME 13.1.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
6. Fasteners: Stainless-steel rivets or self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:
   1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
   2. Letter Color: Per ASME 13.1.
   3. Background Color: Per ASME 13.1.
   4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
   5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
   6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
   7. Fasteners: Stainless-steel rivets or self-tapping screws.
   8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Per ASME 13.1.

C. Background Color: Per ASME 13.1.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
   1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
   2. Lettering Size: Size letters according to ASME A13.1 for piping.

2.4 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
   1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
   2. Fasteners: Brass beaded chain or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
   1. Valve-tag schedule shall be included in operation and maintenance data.

2.5 WARNING TAGS

A. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.
   1. Size: 3 by 5-1/4 inches minimum.
   2. Fasteners: Brass grommet and wire.
   3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."

4. Color: Safety yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Piping Color Coding: Painting of piping is specified in Division 09.

B. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
   1. Near each valve and control device.
   2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
   3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
   4. At access doors, manholes, and similar access points that permit view of concealed piping.
   5. Near major equipment items and other points of origination and termination.
   6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
   7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

D. Pipe Label Color Schedule:
   1. Domestic and Recycled Water Piping
      a. Background: Per ASME 13.1.
      b. Letter Colors: Per ASME 13.1.
   2. Sanitary Waste and Storm Drainage Piping:
      a. Background Color: Per ASME 13.1.
      b. Letter Color: Per ASME 13.1.
   3. Gas Piping:
      a. Background Color: Per ASME 13.1.
      b. Letter Color: Per ASME 13.1.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
   1. Valve-Tag Size and Shape:
      a. Cold Water: 1-1/2 inches, round.
      b. Hot Water: 1-1/2 inches, round.
      c. Recycled Water: 1-1/2 inches, round.
      d. Gas: 1-1/2 inches, round.
   2. Valve-Tag Colors:
      a. Cold Water: Per ASME 13.1.
      b. Hot Water: Per ASME 13.1.
      c. Reclaimed Water: Per ASME 13.1.
      d. Gas: Per ASME 13.1.
   3. Letter Colors:
      a. Cold Water: Per ASME 13.1.
      b. Hot Water: Per ASME 13.1.
      c. Recycled Water: Per ASME 13.1.
      d. Gas: Per ASME 13.1.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 22 05 53

SECTION 22 07 19

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following plumbing piping services:
   1. Domestic cold-water piping.
   2. Domestic hot-water piping.
   3. Roof drains and rainwater leaders.
   4. Supplies and drains for handicap-accessible lavatories and sinks.

B. Related Sections:
   1. Section 22 07 16 "Plumbing Equipment Insulation."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor Permeance, thickness, and jackets (both factory- and field-applied, if any).

B. Sustainable Design Submittals:
   1. Product Data: For adhesives, mastics, and sealants, indicating VOC content.
   2. Laboratory Test Reports: For adhesives, mastics, and sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
   2. Detail attachment and covering of heat tracing inside insulation.
   3. Detail insulation application at pipe expansion joints for each type of insulation.
   4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
   5. Detail removable insulation at piping specialties, equipment connections, and access panels.
   6. Detail application of field-applied jackets.
   7. Detail application at linkages of control devices.

D. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:
   1. Preformed Pipe Insulation Materials: 12 inches long by NPS 2.
   2. Jacket Materials for Pipe: 12 inches long by NPS 2.
   3. Sheet Jacket Materials: 12 inches square.
   4. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Comply with the following applicable standards and other requirements specified for miscellaneous components:
   1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
   1. Block Insulation: ASTM C 552, Type I.
   2. Special-Shaped Insulation: ASTM C 552, Type III.
   3. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
   4. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
   5. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

H. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

I. Mineral-Fiber, Preformed Pipe Insulation:
   1. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.
   1. Adhesive: As recommended by cellular glass manufacturer and with a VOC content of 80 g/L or less.
   2. Adhesives and sealants shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
   1. Adhesive: As recommended by flexible elastomeric and polyolefin manufacturer and with a VOC content of 80 g/L or less.
   2. Adhesives and sealants shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
   1. Adhesive: As recommended by mineral fiber manufacturer and with a VOC content of 80 g/L or less.

2. Adhesives and sealants shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

E. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. Adhesives shall have a VOC content of 80 g/L or less.
2. Adhesives and sealants shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
1. Mastics: As recommended by insulation manufacturer and with a VOC content of 50 g/L or less.
2. Mastics shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
4. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: 60 percent by volume and 66 percent by weight.
4. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.
1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
3. Service Temperature Range: 0 to plus 180 deg F.
4. Color: White.

2.6 SEALANTS

A. Joint Sealants for Cellular-Glass and Phenolic Products:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White or gray.
5. Sealant shall have a VOC content of 420 g/L or less.
6. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. FSK and Metal Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.
5. Sealant shall have a VOC content of 420 g/L or less.
6. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. Sealant shall have a VOC content of 420 g/L or less.
7. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
   1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
   2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
   3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.8 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. for covering pipe and pipe fittings.

B. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.

2.9 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd..

2.10 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. Metal Jacket:
   1. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
      a. Finish and thickness are indicated in field-applied jacket schedules.
      b. Moisture Barrier for Indoor Applications: 1-mil-thick, heat-bonded polyethylene and kraft paper.
      c. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
      d. Factory-Fabricated Fitting Covers:
         1) Same material, finish, and thickness as jacket.
         2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
         3) Tee covers.
         4) Flange and union covers.
         5) End caps.
         6) Beveled collars.
         7) Valve covers.

8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

C. Underground Direct-Buried Jacket: 125-mil-thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.

2.11 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
   1. Width: 3 inches.
   2. Thickness: 11.5 mils.
   3. Adhesion: 90 ounces force/inch in width.
   4. Elongation: 2 percent.
   5. Tensile Strength: 40 lbf/inch in width.
   6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
   1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
   2. Width: 2 inches.
   3. Thickness: 3.7 mils.
   4. Adhesion: 100 ounces force/inch in width.
   5. Elongation: 5 percent.
   6. Tensile Strength: 34 lbf/inch in width.

2.12 SECUREMENTS

A. Bands:
   1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing seal or closed seal.
   2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

C. Wire: 0.080-inch nickel-copper alloy.

2.13 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:
   1. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:
   1. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
   1. Verify that systems to be insulated have been tested and are free of defects.
   2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
   1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
   2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
   4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:
   1. Draw jacket tight and smooth.
   2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
   3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 incheso.c.
      a. For below-ambient services, apply vapor-barrier mastic over staples.
   4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
   5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:
   1. Vibration-control devices.
   2. Testing agency labels and stamps.
   3. Nameplates and data plates.
   4. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
   4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
   4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
   1. Comply with requirements in Section 07 84 13 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:
   1. Pipe: Install insulation continuously through floor penetrations.
   2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07 84 13 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
   1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
   2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
   3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
   4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
   5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
   6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.

3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:
   1. Install mitered sections of pipe insulation.
   2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:
   1. Install preformed valve covers manufactured of same material as pipe insulation when available.
   2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   3. Install insulation to flanges as specified for flange insulation application.
   4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
   1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
   2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
   3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
   4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:
   1. Install preformed pipe insulation to outer diameter of pipe flange.
   2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
   3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
   4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:
   1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:
   1. Install preformed sections of same material as straight segments of pipe insulation when available.
   2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
   3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   4. Install insulation to flanges as specified for flange insulation application.

3.9 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
   1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
   2. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
   3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:
   1. Draw jacket material smooth and tight.
   2. Install lap or joint strips with same material as jacket.
   3. Secure jacket to insulation with manufacturer's recommended adhesive.
   4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
   5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.10 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09.
   1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
      a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by County's Representative. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:
   1. Inspect pipe, fittings, strainers, and valves, randomly selected by County's Representative, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.12 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
   1. Drainage piping located in crawl spaces.
   2. Underground piping.
   3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 INDOOR PIPING INSULATION SCHEDULE

A. Exposed Domestic Cold Water:
   1. NPS 1-1/4 and Smaller: Insulation shall be one of the following:
      a. Cellular Glass: 1-1/2 inches thick.
      b. Flexible Elastomeric: 1 inch thick.
      c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
   2. NPS 1-1/2 and Larger: Insulation shall be one of the following:
      a. Cellular Glass: 1-1/2 inches thick.
      b. Flexible Elastomeric: 1 inch thick.
      c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Domestic Hot and Recirculated Hot Water:
   1. NPS 1-1/4 and Smaller: Insulation shall be one of the following:
      a. Cellular Glass: 1-1/2 inches thick.
      b. Flexible Elastomeric: 1 inch thick.
      c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
   2. NPS 1-1/2 and Larger: Insulation shall be one of the following:
      a. Cellular Glass: 1-1/2 inches thick.
      b. Flexible Elastomeric: 1 inch thick.
      c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

C. Stormwater and Overflow (only the horizontal run to the first vertical riser):
   1. All Pipe Sizes: Insulation shall be one of the following:
      a. Cellular Glass: 1-1/2 inches thick.
      b. Flexible Elastomeric: 1 inch thick.
      c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

D. Roof Drain and Overflow Drain Bodies:
   1. All Pipe Sizes: Insulation shall be one of the following:
      a. Cellular Glass: 1-1/2 inches thick.
      b. Flexible Elastomeric: 1 inch thick.
      c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

E. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:
   1. All Pipe Sizes: Insulation shall be one of the following:
      a. Flexible Elastomeric: 1/2 inch thick.
      b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

3.14 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:
   1. None.

D. Piping, Exposed:
   1. Aluminum, Stucco Embossed: 0.016 inch thick.
   2. Painted Aluminum, Stucco Embossed: 0.016 inch thick.

3.15 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:
   1. None.

D. Piping, Exposed:
   1. Painted Aluminum, Stucco Embossed with Z-Shaped Locking Seam: 0.016 inch thick.

3.16 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION 22 07 19

SECTION 22 08 00

COMMISSIONING OF PLUMBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The purpose of this section is to specify Division 22 responsibilities in the commissioning process which are being directed by the Commissioning Authority (CA). The commissioning requirements designated in this section pertain to building commissioning activities and documentation in support of Calgreen 2013 Commissioning Requirements.

B. The systems to be commissioned are listed in Section 01 91 13 Contractors MUST refer to section 01 91 13 for this and other Commissioning information. Commissioning of Plumbing section does not replace, but instead complements, the contents of the 01 91 13 and all parties shall be held to the information contained in both sections.

C. Commissioning (Cx) requires the participation of Division 22 to ensure that all systems are operating in a manner consistent with the Contract Documents through documented functional testing and startup procedures. The general commissioning requirements and coordination are detailed in Division 01. Division 22 shall be familiar with all parts of Division 01 and the Commissioning Plan issued by the Commissioning Authority (CA) and shall execute all Cx responsibilities assigned to them in the Contract Documents.

1.2 RELATED SECTIONS

A. Section 01 91 13- General Commissioning Requirements

1.3 RESPONSIBILITIES

A. Plumbing and Controls Contractors. The Cx responsibilities applicable to each of the plumbing, controls and TAB contractors of Division 22 are as follows (all references apply to commissioned equipment only, this is a summary of the requirements from 01 91 13, refer to that section for additional details):
   1. Include and itemize the cost of Cx, including functional testing, documentation, and all specified requirements in the contract price.
   2. In each purchase order or subcontract written, include requirements for submittal data, Cx documentation, O&M data and operator training.
   3. Attend a Cx scoping meeting and other meetings necessary to facilitate the Cx process.
   4. Contractors shall provide the CA with normal cut sheets and shop drawing submittals of commissioned equipment.

5. Provide additional requested documentation, prior to normal O&M manual submittals, to the CA for development of functional testing procedures.
    a. This shall include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any Owner-contracted tests, fan and pump curves, preliminary balance reports, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CA.
    b. The CA may request further documentation necessary for the commissioning process, and requests may be made prior to normal submittals.
6. Provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review and approval.
7. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
8. Provide assistance to the CA in preparing the specific functional performance test procedures. Contractors shall review test procedures to ensure feasibility, safety, acceptability under warranty requirements, equipment protection and provide necessary written alarm limits to be used during the tests.
9. During the startup and initial checkout process, execute the pre-functional checklists (provided by CA) for all commissioned equipment and return to the CA.
10. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA for inclusion in the Commissioning Report. This may be done parallel with the pre-functional tests.
11. Address current Architect/Engineer (A/E) punch list items before the commencement of functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.
12. Provide skilled technicians to execute starting of equipment and to rehearse and execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and all resultant problem-solving.
13. Provide skilled technicians to perform functional performance testing under the direction of the CA for specified equipment. This assumes that the controls contractor has rehearsed the functional tests and corrected system (or identified and informed the CA of test procedure) discrepancies from design prior to the verification tests. Assist the CA in interpreting the monitoring data, as necessary.
14. Provide written responses, in a timely manner, to all items noted in the Cx submittal reviews and Cx issues log that relate to Division 22
15. Correct any deficiencies (differences between specified and observed performance) as interpreted by the CA, CxC and A/E and retest the equipment.

Note contractor may be responsible for the cost of retesting if there are excessive test failures; see Back-Charging Section 01 91 13, Part 3.5 Item A.

16. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
17. During construction, maintain as-built red-line drawings for all drawings and final CAD as-builts for contractor-generated coordination drawings. Provide to CA as requested for functional test development and update after completion of commissioning (excluding deferred testing and seasonal testing).
18. Provide training of the Owner's operating staff using expert qualified personnel, as specified.
19. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
20. Warranty Period
    a. Assist CA in execution of select seasonal or deferred functional performance testing.
    b. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

B. Controls Contractor (if applicable for plumbing system). The commissioning responsibilities of the controls contractor, during construction and acceptance phases in addition to those listed in (A) are:
1. As-Built Sequence of Operation Submittals. The Controls Contractor's submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, including time of day schedules, schedule frequency, and detailed point listings with ranges and initial setpoints.
2. Control Drawings Submittal
    a. The control drawings shall have a key to all abbreviations.
    b. The control drawings shall contain graphic schematic depictions of the systems and each component.
    c. The schematics will include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
    d. Provide a full points list.
3. An updated as-built version of the control drawings and sequences of operation shall be included in the final controls as-built drawings submittal.
4. Assist and cooperate with the TAB contractor in the following manner:
    a. Meet with the TAB contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB contractor any needed unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.).
    b. For a given area, have all required prefunctional checklists, calibrations, startup and selected functional tests of the system completed and approved by the CA prior to TAB.

c. Provide a qualified technician to operate the controls to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.
d. Coordinate with the TAB contractor to acquire all balance related setpoint, for example the minimum duct pressure required at design flow and/or the pump system pressure differential required at design flow condition.

5. Assist and cooperate with the CA in the following manner:
   a. Review Draft Functional Performance Tests and issue comments to CA.
   b. Successfully rehearse Functional Performance Tests and provide a signed copy prior to CA visit to witness test execution.
   c. Using a skilled technician who is familiar with this building, execute the functional testing of the controls system. Assist the CA in interpreting the monitoring data, as necessary.
   d. Execute all control system trend logs specified in Functional Tests. Trend data will be required in electronic format, specifically in a Microsoft Excel compatible format (ASCII text, comma delineated,.xls, etc.).
   e. Ensure that all of the trended points are sampled at 1 minute intervals, all points may be trended simultaneously and the data is stored for all points at minimum for a 1 year period.
   f. Provide the Commissioning Authority remote internet access to the Building Automation System during the Commissioning Period.
6. Provide a signed and dated certification to the CA and CMGC Commissioning Coordinator upon completion of the checkout of each controlled device, equipment and system prior to functional testing for each piece of equipment or system, that all system programming is complete as to all respects of the Contract Documents, except functional testing requirements.
7. List and clearly identify on the as-built duct and piping drawings the locations of all static and differential pressure sensors. (if applicable)

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Division 22 shall provide all test equipment necessary to fulfill the testing requirements of this Division. Refer to 01 91 13.

PART 3 - EXECUTION

3.1 COMMISSIONING PROCESS AND PROCEDURES

A. Refer to 01 91 13 – General Commissioning Requirements for Process and Procedures.

3.2 PRE-FUNCTIONAL CHECKLISTS

A. The plumbing and controls contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this specification. Division 22

contractors have start-up responsibility and are required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures do not relieve or lessen this responsibility or shift that responsibility partially to the CA or the Owner.

B. Review and Complete Pre-functional Checklists in accordance with Section 01 91 13 and 22 08 00

C. CMGC commissioning coordinator shall verify completion of all items, sign and return the checklist to the Commissioning Authority as an indication of final completion with all installation criteria as specified in the Project Contract Documents

D. A separate completed checklist shall be submitted for each system and item of equipment within the commissioning scope of work, as specified in 01 91 13

E. The Pre-Functional Checklists do not represent all the contract documents for the associated equipment. Completion of the items on this checklist does not release the contractor from requirements specified elsewhere.

3.3 FUNCTIONAL PERFORMANCE TESTING

A. The Functional Performance Test (FPT) Procedures shall be developed, performed, and demonstrated in accordance with Section 01 91 13.

B. Contractor is responsible for conducting test runs of all required Functional Performance Tests, and submit results to the CA prior to the Commissioning Authority witnessed Functional Testing. See Section 01 91 13 for additional process details.

C. The initial FPTs shall be provided after review of the controls submittal. The final FPTs may be modifications of the initial FPTs, and FPTs may be added; modifications and additions to be made by the Commissioning Authority after equipment submittals have been accepted.

D. The CMGC Commissioning Coordinator shall coordinate the subcontractors, with the Commissioning Authority's input, in developing, performing, and demonstrating the Working FPT.

E. Functional testing shall consist of the following four phases:
   1. Component testing:
      a. Component testing applies to all control input and output devices, including those provided by the equipment suppliers and those provided with the Building Automation System (BAS). Examples include but are not limited to: sensor assemblies, detectors, relays and switches, valves, dampers, and actuators
      b. Component testing applies to thermometers, gauges:

c. Component testing consists of demonstrating field I/O calibration and operation including but not limited to:
   1) Accuracy of sensors is within design temperature range as specified.
   2) Alarmed points report correctly to operator work station.
   3) Accuracy and settings of binary switches and alarms is as specified, within design temperature range
   4) Actuators operate smoothly in a linear relationship with the signal they receive over the full range of operation
   5) Fail safe operation of components and controllers is as specified for loss of control signal, electric power, and network communications
   6) All components, values and alarms are correctly mapped to operator interface station
   7) Air pressure reference points appropriately located and protected from transient effects.

2. Systems Testing; Operational Verification: After functional testing of the system components has been successfully completed, each sequence of operation and control system function shall be functionally tested, including those provided by the equipment suppliers and those provided with the Building Automation System (BAS). Each control loop shall be tested to verify stable control with the specified and appropriate responses. Testing may include examination of trended data for any point, even where not explicitly called out in functional test script.
3. Systems Testing - Integrated System Verification: After operational testing has successfully demonstrated that each system functions in accordance with the project documents, functional testing shall occur to verify that the interaction between the systems is as required. Each interactive function shall be functionally tested, including those provided by the equipment suppliers and those provided with the BAS.
4. Systems Testing - Real Time Performance Analysis (trend logging):
   a. After operational testing has been successfully completed real time performance testing may be performed to further corroborate correct operation and/or verify the operation of systems that eluded the initial test phase. Data shall be logged for the intervals and periods specified in the FPT procedures. Unless otherwise specified in the FPTs, test periods shall include occupied, unoccupied, weekday and weekend schedules.
   b. All points shall be trended, initiated at the end of construction, continuing over the entire commissioning period and left in place for future use or seasonal commissioning. All points shall be simultaneously trended per requirements indicated on functional performance tests. Historical archiving shall be enabled so that data is continuous with no gaps and accessible in the future. The data shall be capable of being stored at a minimum of 1 year period.
   c. Internet or web-based remote access shall be provided to the commissioning agent for the commissioning period. Trends shall be displayed graphically and shall be user configurable at the graphical interface. Graphical displays shall be capable of containing multiple points on a single graph.

d. Analysis of the data shall demonstrate that that the systems operate in accordance with the acceptance criteria specified in the FPT procedures. Verify that data demonstrates acceptable results before submitting for CA review. If acceptable results are not demonstrated, perform testing and trouble shooting and corrective action to provide resolution. Provisions for retesting, as specified in 01 91 13 shall apply to trend log analysis.

3.4 FUNCTIONAL PERFORMANCE TEST (FPT) SEASONAL TESTING

A. Perform seasonal testing in accordance with the specification should it be deemed necessary by the CA and the Owner to prove acceptable system performance.

3.5 ISSUE CORRECTION

A. Refer to Section 01 91 13 - Part 3.5 for Issue Resolution procedures.

3.6 OPERATION AND MAINTENANCE (O&M) MANUALS

A. The following O&M manual requirements do not replace the O&M Manual documentation requirements elsewhere in these specifications.

B. Document contents and formant shall be in compliance with Division 01.

C. Division 22 shall compile and prepare documentation for all equipment and systems covered in Division 22 and deliver this documentation to the GC for inclusion in the O&M manuals prior to the training of Owner personnel.

D. The CA shall receive a copy of the O&M Manual for review.

3.7 TRAINING OF OWNER PERSONNEL

A. Refer to Section 01 91 13 - Part 3.8.

END OF SECTION 22 08 00

SECTION 22 11 16

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
   2. Encasement for piping.

B. Related Requirements:
   1. Section 22 11 19 "Domestic Water Piping Specialties" for water-service piping and water meters outside the building from source to the point where water-service piping enters the building.

1.2 QUALITY ASSURANCE

A. All pipe and fittings shall be manufactured domestically in the United States.

1.3 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

B. Sustainable Design Submittals:
   1. Product Data: For adhesives, indicating VOC content.
   2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

1.4 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

1.5 FIELD CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
   1. Notify Owner no fewer than two days in advance of proposed interruption of water service.
   2. Do not interrupt water service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

C. All pipe and fittings shall be manufactured domestically in the United States.

2.2 COPPER TUBE AND FITTINGS

A. All pipe and fittings shall be manufactured domestically in the United States.

B. Hard Copper Tube: ASTM B 88, Type L and ASTM B 88, Type M water tube, drawn temper.

C. Hard Copper Tube: ASTM B 88, Type K and ASTM B 88, drawn temper; brazed joints.

D. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

E. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

F. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

G. Copper Unions:
   1. MSS SP-123.
   2. Cast-copper-alloy, hexagonal-stock body.
   3. Ball-and-socket, metal-to-metal seating surfaces.
   4. Solder-joint or threaded ends.

H. Copper-Tube, Extruded-Tee Connections:
   1. Description: Tee formed in copper tube according to ASTM F 2014.

I. Appurtenances for Grooved-End Copper Tubing:
   1. Bronze Fittings for Grooved-End, Copper Tubing: ASTM B 75 copper tube or ASTM B 584 bronze castings.
   2. Mechanical Couplings for Grooved-End Copper Tubing:
      a. Copper-tube dimensions and design similar to AWWA C606.
      b. Ferrous housing sections.
      c. EPDM-rubber gaskets suitable for hot and cold water.
      d. Bolts and nuts.

e. Minimum Pressure Rating: 300 psig.

2.3 DUCTILE-IRON PIPE AND FITTINGS

A. All pipe and fittings shall be manufactured domestically in the United States.

B. Mechanical-Joint, Ductile-Iron Pipe:
1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

C. Standard-Pattern, Mechanical-Joint Fittings:
1. AWWA C110/A21.10, ductile or gray iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

D. Compact-Pattern, Mechanical-Joint Fittings:
1. AWWA C153/A21.53, ductile iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

E. Plain-End, Ductile-Iron Pipe: AWWA C151/A21.51.

F. Appurtenances for Grooved-End, Ductile-Iron Pipe:
1. Fittings for Grooved-End, Ductile-Iron Pipe: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron castings with dimensions that match pipe.

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:
1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.5 TRANSITION FITTINGS

A. General Requirements:
   1. Same size as pipes to be joined.
   2. Pressure rating at least equal to pipes to be joined.
   3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

2.6 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Red brass nipple.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Division 31 for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. Install underground copper tube and ductile-iron pipe in PE encasement according to ASTM A 674 or AWWA C105/A21.5.

E. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 22 05 19 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 22 11 19 "Domestic Water Piping Specialties."

F. Install shutoff valve immediately upstream of each dielectric fitting.

G. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 22 11 19 "Domestic Water Piping Specialties."

H. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

I. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

K. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

L. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

M. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

N. Install piping to permit valve servicing.

O. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

P. Install piping free of sags and bends.

Q. Install fittings for changes in direction and branch connections.

R. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

S. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 22 05 19 "Meters and Gages for Plumbing Piping."

T. Install thermostats in hot-water circulation piping.

U. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Section 22 05 19 "Meters and Gages for Plumbing Piping."

V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

G. Joint Construction for Grooved-End Copper Tubing: Make joints according to AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.

H. Joint Construction for Grooved-End, Ductile-Iron Piping: Make joints according to AWWA C606. Cut round-bottom grooves in ends of pipe at gasket-seat dimension required for specified (flexible or rigid) joint. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.

I. Joint Construction for Grooved-End Steel Piping: Make joints according to AWWA C606. Roll groove ends of pipe as specified. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.

J. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

K. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:
   1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
   2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger, support products, and installation in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."
   1. Vertical Piping: MSS Type 8 or 42, clamps.
   2. Individual, Straight, Horizontal Piping Runs:
      a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
      b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
      c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
   3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.
3. NPS 2: 10 feet with 3/8-inch rod.
4. NPS 2-1/2: 11 feet with 1/2-inch rod.
5. NPS 3 and NPS 3-1/2: 12 feet with 1/2-inch rod.
6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.

H. Install supports for vertical steel piping every 15 feet.

I. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.

3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Piping Inspections:
      a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
      b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
         1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
         2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
      c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
      d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
   2. Piping Tests:
      a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
      b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
      c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
      d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 ADJUSTING

A. Perform the following adjustments before operation:
1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Fill and isolate system according to either of the following:
1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

d. Repeat procedures if biological examination shows contamination.
e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Clean non-potable water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be one of the following:
1. Hard copper tube, ASTM B 88, Type K; wrought-copper, brazed joints.

E. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be one of the following:
1. Hard copper tube, ASTM B 88, Type K; wrought-copper, brazed-joint fittings.

F. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:
1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and brazed or soldered joints.

G. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be one of the following:
1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and brazed or soldered joints.

H. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
   1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller. Use butterfly or ball valve with flanged ends for piping NPS 2-1/2 and larger.
   2. Throttling Duty: Use ball valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
   3. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.
   4. Drain Duty: Hose-end drain valves.

I. Use check valves to maintain correct direction of domestic water flow to and from equipment.

J. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION 22 11 16

SECTION 22 11 19

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Vacuum breakers.
2. Backflow preventers.
3. Balancing valves.
4. Temperature-actuated, water mixing valves.
5. Strainers.
6. Hose bibbs.
7. Drain valves.
8. Water-hammer arresters.
9. Air vents.
10. Trap-seal primer valves.
11. Trap-seal primer systems.
12. Specialty valves.
13. Flexible connectors.

B. Related Requirements:
1. Section 22 05 19 "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.
2. Section 22 11 16 "Domestic Water Piping" for water meters.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For domestic water piping specialties.
1. Include diagrams for power, signal, and control wiring.

C. Sustainable Design Submittals:
1. Product Data: For water consumption.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61 Annex G. Mark "NSF-pw" on plastic piping components.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
   1. Standard: ASSE 1001.
   2. Size: NPS 1/4 to NPS 3, as required to match connected piping.
   3. Body: Bronze.
   4. Inlet and Outlet Connections: Threaded.
   5. Finish: Chrome plated.

B. Hose-Connection Vacuum Breakers:
   1. Standard: ASSE 1011.
   2. Body: Bronze, nonremovable, with manual drain.
   3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
   4. Finish: Chrome or nickel plated.

C. Pressure Vacuum Breakers:
   1. Standard: ASSE 1020.
   2. Operation: Continuous-pressure applications.
   3. Pressure Loss: 5 psig maximum, through middle third of flow range.
   4. Accessories:
      a. Valves: Ball type, on inlet and outlet.

2.4 BACKFLOW PREVENTERS

A. Intermediate Atmospheric-Vent Backflow Preventers:
   1. Standard: ASSE 1012.
   2. Operation: Continuous-pressure applications.
   3. Body: Bronze.
   4. End Connections: Union, solder joint.
   5. Finish: Chrome plated.

B. Reduced-Pressure-Principle Backflow Preventers:
   1. Standard: ASSE 1013.
   2. Operation: Continuous-pressure applications.
   3. Pressure Loss: 10 psig maximum, through middle third of flow range.

4. Body: Bronze for NPS 2 and smaller; steel with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
5. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
6. Configuration: Designed for horizontal, straight-through flow.
7. Accessories:
   a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
   b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
   c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

2.5 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:
   1. Type: Ball valve with two readout ports and memory-setting indicator.
   2. Body: Brass or bronze.
   3. Size: Same as connected piping, but not larger than NPS 2.
   4. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

B. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

2.6 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices:
   1. Standard: ASSE 1017.
   2. Pressure Rating: 125 psig.
   3. Type: Thermostatically controlled, water mixing valve.
   4. Material: Bronze body with corrosion-resistant interior components.
   5. Connections: Threaded inlets and outlet.
   6. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
   7. Valve Finish: Chrome plated.

B. Primary, Thermostatic, Water Mixing Valves:
   1. Standard: ASSE 1017.
   2. Pressure Rating: 125 psig minimum unless otherwise indicated.
   3. Type: Cabinet-type, thermostatically controlled, water mixing valve.
   4. Material: Bronze body with corrosion-resistant interior components.
   5. Connections: Threaded inlets and outlet.
   6. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
   7. Valve Finish: Chrome plated.
   8. Piping Finish: Copper.

9. Cabinet: Factory fabricated, stainless steel, for recessed mounting and with hinged, stainless-steel door.

C. Individual-Fixture, Water Tempering Valves:
1. Standard: ASSE 1016, thermostatically controlled, water tempering valve.
2. Pressure Rating: 125 psig minimum unless otherwise indicated.
3. Body: Bronze body with corrosion-resistant interior components.
4. Temperature Control: Adjustable.
5. Inlets and Outlet: Threaded.
6. Finish: Rough or chrome-plated bronze.

2.7 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:
1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:
   a. Strainers NPS 2 and Smaller: 0.033 inch.
   b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch.
   c. Strainers NPS 5 and Larger: 0.10 inch.
6. Drain: Pipe plug.

2.8 HOSE BIBBS

A. Hose Bibbs:
1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral or field-installation, non-removable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Wheel handle.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

16. Freezing Area: Anti-siphon, frost-free wall or free-standing faucet.

2.9 DRAIN VALVES

A. Gate-Valve-Type, Hose-End Drain Valves:
   1. Standard: MSS SP-80 for gate valves.
   2. Pressure Rating: Class 125.
   3. Size: NPS 3/4.
   4. Body: ASTM B 62 bronze.
   5. Inlet: NPS 3/4 threaded or solder joint.
   6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.10 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:
   1. Standard: ASSE 1010 or PDI-WH 201.
   2. Type: Copper tube with piston.
   3. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.11 AIR VENTS

A. Bolted-Construction Automatic Air Vents:
   1. Body: Bronze.
   2. Pressure Rating and Temperature: 125-psig minimum pressure rating at 140 deg F.
   3. Float: Replaceable, corrosion-resistant metal.
   4. Mechanism and Seat: Stainless steel.
   5. Size: NPS 1/2 minimum inlet.
   6. Inlet and Vent Outlet End Connections: Threaded.

2.12 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:
   1. Standard: ASSE 1018.
   2. Pressure Rating: 125 psig minimum.
   3. Body: Bronze.
   4. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
   5. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
   6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type, Trap-Seal Primer Device:
   1. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.
   2. Size: NPS 1-1/4 minimum.

3. Material: Chrome-plated, cast brass.

2.13 TRAP-SEAL PRIMER SYSTEMS

A. Trap-Seal Primer Systems:
   1. Standard: ASSE 1044.
   2. Piping: NPS 3/4, ASTM B 88, Type L; copper, water tubing.
   3. Cabinet: Recessed-mounted steel box with stainless-steel cover.
   4. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V ac power.
      a. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   5. Vacuum Breaker: ASSE 1001.
   6. Number Outlets: As required.
   7. Size Outlets: NPS 1/2.

2.14 SPECIALTY VALVES

A. Comply with requirements for general-duty metal valves in Section 22 05 23.12 "Ball Valves for Plumbing Piping," Section 22 05 23.13 "Butterfly Valves for Plumbing Piping," Section 22 05 23.14 "Check Valves for Plumbing Piping," and Section 22 05 23.15 "Gate Valves for Plumbing Piping."

2.15 FLEXIBLE CONNECTORS

A. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.
   1. Working-Pressure Rating: Minimum 200 psig.
   2. End Connections NPS 2 and Smaller: Threaded copper pipe or plain-end copper tube.
   3. End Connections NPS 2-1/2 and Larger: Flanged copper alloy.

B. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.
   1. Working-Pressure Rating: Minimum 200 psig.
   2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.
   3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
   1. Locate backflow preventers in same room as connected equipment or system.

2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
3. Do not install bypass piping around backflow preventers.

B. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.

C. Install water-control valves with inlet and outlet shutoff valves and bypass with globe valve. Install pressure gages on inlet and outlet.

D. Install balancing valves in locations where they can easily be adjusted.

E. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
1. Install cabinet-type units recessed in or surface mounted on wall as specified.

F. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, solenoid valve, and pump.

G. Install outlet boxes recessed in wall or surface mounted on wall. Install 2-by-4-inch fire-retardant-treated-wood blocking, wall reinforcement between studs. Comply with requirements for fire-retardant-treated-wood blocking in Division 06.

H. Install water-hammer arresters in water piping according to PDI-WH 201.

I. Install air vents at high points of water piping.

J. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

K. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

L. Install trap-seal primer systems with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow.

3.2 CONNECTIONS

A. Comply with requirements for ground equipment in Section 26 05 26 "Grounding and Bonding for Electrical Systems."

B. Fire-retardant-treated-wood blocking is specified in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.3 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
   1. Pressure vacuum breakers.
   2. Intermediate atmospheric-vent backflow preventers.
   3. Reduced-pressure-principle backflow preventers.
   4. Water pressure-reducing valves.
   5. Calibrated balancing valves.
   6. Primary, thermostatic, water mixing valves.
   7. Manifold, thermostatic, water mixing-valve assemblies.
   8. Primary water tempering valves.
   9. Hose stations.
   10. Supply-type, trap-seal primer valves.
   11. Trap-seal primer systems.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Test each pressure vacuum breaker, reduced-pressure-principle backflow preventer, double-check, backflow-prevention assembly, and double-check, detector-assembly backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 22 11 19

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pipe, tube, and fittings.
   2. Specialty pipe fittings.
   3. Encasement for underground metal piping.

B. Related Sections:
   1. Section 22 13 29 "Sanitary Sewerage Pumps" for effluent and sewage pumps.

1.2 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
   1. Soil, Waste, and Vent Piping: 10-foot head of water.
   2. Waste, Force-Main Piping: 50 psig.

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:
   1. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.
   2. Laboratory Test Reports for Credit IEQ 4: For solvent cements and adhesive primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: For sovent drainage system. Include plans, elevations, sections, and details.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. All pipe and fittings shall be manufactured domestically in the United States.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
1. Notify Owner no fewer than two days in advance of proposed interruption of sanitary waste service.
2. Do not proceed with interruption of sanitary waste service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Heavy-Duty, Hubless-Piping Couplings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. ANACO-Husky.
   b. Clamp-All Corp.
2. Standards: ASTM C 1277 and ASTM C 1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.3 GALVANIZED-STEEL PIPE AND FITTINGS

A. Galvanized-Steel Pipe: ASTM A 53/A 53M, Type E, Standard Weight class. Include square-cut-grooved or threaded ends matching joining method.

B. Galvanized-Cast-Iron Drainage Fittings: ASME B16.12, threaded.

C. Steel Pipe Pressure Fittings:
   1. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106/A 106M, Schedule 40, seamless steel pipe. Include ends matching joining method.
   2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
   3. Galvanized-Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, standard pattern.

D. Cast-Iron Flanges: ASME B16.1, Class 125.
   1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
   2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

E. Grooved-Joint, Galvanized-Steel-Pipe Appurtenances:
   1. Galvanized, Grooved-End Fittings for Galvanized-Steel Piping: ASTM A 536 ductile-iron castings, ASTM A 47/A 47M malleable-iron castings, ASTM A 234/A 234M forged steel fittings, or ASTM A 106/A 106M steel pipes with dimensions matching ASTM A 53/A 53M steel pipe, and complying with AWWA C606 for grooved ends.
   2. Grooved Mechanical Couplings for Galvanized-Steel Piping: ASTM F 1476, Type I. Include ferrous housing sections with continuous curved keys; EPDM-rubber gasket suitable for hot and cold water; and bolts and nuts.

2.4 COPPER TUBE AND FITTINGS

A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

C. Copper Pressure Fittings:
   1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
   2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

D. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
   1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
   2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

E. Solder: ASTM B 32, lead-free with ASTM B 813, water-flushable flux.

2.5 SPECIALTY PIPE FITTINGS

A. Transition Couplings:
   1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
   2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
   3. Unshielded, Non-pressure Transition Couplings:
      a. Standard: ASTM C 1173.
      b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
      c. Sleeve Materials:
         1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
         2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
         3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
   4. Shielded, Non-pressure Transition Couplings:
      a. Standard: ASTM C 1460.
      b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
   5. Pressure Transition Couplings:
      a. Standard: AWWA C219.
      b. Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
      c. Center-Sleeve Material: Manufacturer's standard.
      d. Gasket Material: Natural or synthetic rubber.
      e. Metal Component Finish: Corrosion-resistant coating or material.

B. Dielectric Fittings:
   1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

2. Dielectric Nipples:
   a. Description:
      1) Standard: IAPMO PS 66
      2) Electroplated steel nipple.
      3) Pressure Rating: 300 psig at 225 deg F.
      4) End Connections: Male threaded or grooved.
      5) Lining: Inert and noncorrosive, propylene.

2.6 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Standard: ASTM A 674 or AWWA C105/A 21.5.

B. Material: Linear low-density polyethylene film of 0.008-inch or high-density, cross-laminated polyethylene film of 0.004-inch minimum thickness.

C. Form: Sheet or tube.

D. Color: Black or natural.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

K. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

L. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

M. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
   1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
   2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
   1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.

O. Install steel piping according to applicable plumbing code.

P. Install stainless-steel piping according to ASME A112.3.1 and applicable plumbing code.

Q. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

R. Install engineered soil and waste drainage and vent piping systems as follows:
   1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
   2. Sovent Drainage System: Comply with ASSE 1043 and sovent fitting manufacturer's written installation instructions.
   3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

S. Install underground, ductile-iron, force-main piping according to AWWA C600. Install buried piping inside building between wall and floor penetrations and

connection to sanitary sewer piping outside building with restrained joints. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.
1. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.

T. Install underground, copper, force-main tubing according to CDA's "Copper Tube Handbook."
1. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.

U. Install force mains at elevations indicated.

V. Plumbing Specialties:
1. Install backwater valves in sanitary waster gravity-flow piping. Comply with requirements for backwater valves specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
3. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 22 13 19 "Sanitary Waste Piping Specialties."

W. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

X. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

Y. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

Z. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.2 JOINT CONSTRUCTION

A. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

B. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

C. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

D. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

E. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

3.3 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:
1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: Unshielded, non-pressure transition couplings.
3. In Aboveground Force Main Piping: Fitting-type transition couplings.
4. In Underground Force Main Piping:
   a. NPS 1-1/2 and Smaller: Fitting-type transition couplings.
   b. NPS 2 and Larger: Pressure transition couplings.

B. Dielectric Fittings:
1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples or unions.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges, flange kits, or nipples.
4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.4 VALVE INSTALLATION

A. General valve installation requirements are specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping," Section 22 05 23.13 "Butterfly Valves for Plumbing Piping," Section 22 05 23.14 "Check Valves for Plumbing Piping."

B. Shutoff Valves:
1. Install shutoff valve on each sewage pump discharge.
2. Install gate or full-port ball valve for piping NPS 2 and smaller.
3. Install gate valve for piping NPS 2-1/2 and larger.

C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

D. Backwater Valves: Install backwater valves in piping subject to backflow.
   1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.
   2. Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.
   3. Install backwater valves in accessible locations.
   4. Comply with requirements for backwater valve specified in Section 22 13 19 "Sanitary Waste Piping Specialties."

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."
   1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
   2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
   3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
   4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
   5. Vertical Piping: MSS Type 8 or Type 42, clamps.
   6. Install individual, straight, horizontal piping runs:
      a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
      b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
      c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
   7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
   8. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
   2. NPS 3: 60 inches with 1/2-inch rod.

3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.
3. NPS 2: 10 feet with 3/8-inch rod.
4. NPS 2-1/2: 11 feet with 1/2-inch rod.
5. NPS 3: 12 feet with 1/2-inch rod.
6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
7. NPS 6 and NPS 8: 12 feet with 3/4-inch rod.
8. NPS 10 and NPS 12: 12 feet with 7/8-inch rod.

I. Install supports for vertical steel piping every 15 feet.

J. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4: 72 inches with 3/8-inch rod.
2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
3. NPS 2-1/2: 108 inches with 1/2-inch rod.
4. NPS 3 and NPS 5: 10 feet with 1/2-inch rod.
5. NPS 6: 10 feet with 5/8-inch rod.
6. NPS 8: 10 feet with 3/4-inch rod.

K. Install supports for vertical copper tubing every 10 feet.

L. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:
1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.

3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Install horizontal backwater valves with cleanout cover flush with floor.
6. Comply with requirements for backwater valves, cleanouts, and drains specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
7. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Connect force-main piping to the following:
   1. Sanitary Sewer: To exterior force main.
   2. Sewage Pump: To sewage pump discharge.

E. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

F. Make connections according to the following unless otherwise indicated:
   1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
   2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
   1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
   2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
   1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
   2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
   3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
   4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
   5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
   6. Prepare reports for tests and required corrective action.

E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
   1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
   2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
   3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
   4. Prepare reports for tests and required corrective action.

3.9 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:
   1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
   2. Galvanized-steel pipe, drainage fittings, and threaded joints.
   3. Copper DWV tube, copper drainage fittings, and soldered joints.
   4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

C. Aboveground, soil and waste piping NPS 5 and larger shall be any of the following:
   1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
   2. Galvanized-steel pipe, drainage fittings, and threaded joints.

D. Aboveground, vent piping NPS 4 and smaller shall be any of the following:
   1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
   2. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
   3. Galvanized-steel pipe, drainage fittings, and threaded joints.
   4. Copper DWV tube, copper drainage fittings, and soldered joints.
   5. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

E. Aboveground, vent piping NPS 5 and larger shall be any of the following:
   1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
   2. Galvanized-steel pipe, drainage fittings, and threaded joints.
   3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

F. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:
   1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
   2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

G. Underground, soil and waste piping NPS 5 and larger shall be any of the following:
   1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; coupled joints.
   2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

H. Aboveground sanitary-sewage force mains NPS 1-1/2 and NPS 2 shall be any of the following:
   1. Hard copper tube, Type L; copper pressure fittings; and soldered joints.
   2. Galvanized-steel pipe, pressure fittings, and threaded joints.

I. Aboveground sanitary-sewage force mains NPS 2-1/2 to NPS 6 shall be any of the following:
   1. Hard copper tube, Type L; copper pressure fittings; and soldered joints.
   2. Galvanized-steel pipe, pressure fittings, and threaded joints.
   3. Grooved-end, galvanized-steel pipe; grooved-joint, galvanized-steel-pipe appurtenances; and grooved joints.

J. Underground sanitary-sewage force mains NPS 4 and smaller shall be any of the following:
   1. Hard copper tube, Type L; copper pressure fittings; and soldered joints.
   2. Ductile-iron, mechanical-joint piping and mechanical joints.
   3. Ductile-iron, grooved-joint piping and grooved joints.
   4. Fitting-type transition coupling for piping smaller than NPS 1-1/2 and pressure transition coupling for NPS 1-1/2 and larger if dissimilar pipe materials.

END OF SECTION 22 13 16

SECTION 22 13 19

SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Backwater valves.
2. Cleanouts.
3. Floor drains.
4. Trench drains.
5. Channel drainage systems.
6. Roof flashing assemblies.
7. Through-penetration firestop assemblies.
8. Miscellaneous sanitary drainage piping specialties.
9. Flashing materials.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FOG: Fats, oils, and greases.

C. FRP: Fiberglass-reinforced plastic.

D. HDPE: High-density polyethylene plastic.

E. PE: Polyethylene plastic.

F. PP: Polypropylene plastic.

G. PVC: Polyvinyl chloride plastic.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rated capacities, operating characteristics, and accessories,

B. Shop Drawings: Show fabrication and installation details for frost-resistant vent terminals.
   1. Wiring Diagrams: Power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer Seismic Qualification Certification: Submit certification that FOG disposal systems, grease interceptors, grease removal devices, oil interceptors, accessories, and components will withstand seismic forces defined in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment." Include the following:
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
      a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 BACKWATER VALVES

A. Horizontal, Cast-Iron Backwater Valves:
   1. Standard: ASME A112.14.1.
   2. Size: Same as connected piping.
   3. Body: Cast iron.
   4. Cover: Cast iron with bolted or threaded access check valve.
   5. End Connections: Hubless.
   6. Type Check Valve: Removable, bronze, swing check, factory assembled or field modified to hang closed.
   7. Extension: ASTM A 74, Service class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at floor; replaces backwater valve cover.

B. Drain-Outlet Backwater Valves:
   1. Size: Same as floor drain outlet.
   2. Body: Cast iron or bronze made for vertical installation in bottom outlet of floor drain.
   3. Check Valve: Removable ball float.
   4. Inlet: Threaded.
   5. Outlet: Threaded or spigot.

2.2 CLEANOUTS

A. Exposed Metal Cleanouts:
   1. ASME A112.36.2M, Cast-Iron Cleanouts:
   2. ASME A112.3.1, Stainless-Steel Cleanouts:
   3. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
   4. Size: Same as connected drainage piping
   5. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
   6. Closure: Countersunk, brass plug.
   7. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Metal Floor Cleanouts:
   1. ASME A112.36.2M, Cast-Iron Cleanouts:
   2. Standard: ASME A112.36.2M for adjustable housing cleanout.
   3. Size: Same as connected branch.
   4. Body or Ferrule: Cast iron.
   5. Closure: Brass plug with straight threads and gasket.
   6. Adjustable Housing Material: Cast iron with threads.
   7. Frame and Cover Material and Finish: Polished bronze.
   8. Frame and Cover Shape: Round.
   9. Top Loading Classification: Medium Duty.

10. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
11. Standard: ASME A112.3.1.
12. Size: Same as connected branch.
13. Housing: Stainless steel.
14. Closure: Stainless steel with seal.
15. Riser: Stainless-steel drainage pipe fitting to cleanout.

C. Cast-Iron Wall Cleanouts:
1. Standard: ASME A112.36.2M. Include wall access.
2. Size: Same as connected drainage piping.
3. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
4. Closure: Countersunk, drilled-and-threaded brass plug.
5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
6. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.

2.3 FLOOR DRAINS

A. Cast-Iron Floor Drains:
1. Standard: ASME A112.6.3.
2. Pattern: Area drain.
3. Body Material: Gray iron.
4. Seepage Flange: Required.
5. Anchor Flange: Not required.
6. Clamping Device: Not required.
7. Outlet: Bottom.
8. Backwater Valve: Not required.
9. Coating on Interior and Exposed Exterior Surfaces: Not required.
10. Sediment Bucket: Not required.
11. Top or Strainer Material: Nickel bronze.
12. Top of Body and Strainer Finish: Nickel bronze.
13. Top Shape: Round.
14. Top Loading Classification: Medium Duty.
15. Funnel: Not required.
16. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
17. Trap Material: Cast iron.
18. Trap Pattern: Standard P-trap.
19. Trap Features: Cleanout and trap-seal primer valve drain connection.

2.4 TRENCH DRAINS

A. Trench Drains:
1. Standard: ASME A112.6.3 for trench drains.
2. Material: Ductile or gray iron.

3. Flange: Seepage.
4. Clamping Device: Not required.
5. Outlet: End.
6. Grate Material: Ductile iron.
7. Grate Finish: Not required.
8. Top Loading Classification: Light Duty.
9. Trap Material: Cast iron.
10. Trap Pattern: Standard P-trap.

2.5 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:
   1. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
   2. Size: Same as connected soil, waste, or vent stack.
   3. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
   4. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
   5. Special Coating: Corrosion resistant on interior of fittings.

2.6 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:
   1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
   2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Floor-Drain, Trap-Seal Primer Fittings:
   1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
   2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

C. Air-Gap Fittings:
   1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
   2. Body: Bronze or cast iron.
   3. Inlet: Opening in top of body.
   4. Outlet: Larger than inlet.
   5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

D. Sleeve Flashing Device:
   1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel

pipe extension in top of fitting that will extend 2 inches above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

E. Stack Flashing Fittings:
1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

F. Vent Caps:
1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

G. Expansion Joints:
1. Standard: ASME A112.21.2M.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

2.7 MOTORS

A. General requirements for motors are specified in Section 22 05 13 "Common Motor Requirements for Plumbing Equipment."
1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment Mounting:
1. Comply with requirements for vibration isolation and seismic control devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
2. Comply with requirements for vibration isolation devices specified in Section 22 05 48 "Vibration Controls for Plumbing Piping and Equipment."

B. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

C. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.

2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

D. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

E. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

F. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
    a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
    b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
    c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

G. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface, unless otherwise indicated.

H. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

I. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

J. Install through-penetration firestop assemblies in plastic conductors and stacksat floor penetrations.

K. Assemble open drain fittings and install with top of hub 1 inch above floor.

L. Install deep-seal traps on floor drains and other waste outlets, if indicated.

M. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

N. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

O. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

P. Install vent caps on each vent pipe passing through roof.

Q. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

R. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

S. Install wood-blocking reinforcement for wall-mounting-type specialties.

T. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 22 13 16 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
   1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
   2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
   1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
   2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.

3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07.

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.6 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 13 19

SECTION 22 13 29

SANITARY SEWERAGE PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Submersible effluent pumps.
   2. Submersible sewage pumps.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Wiring Diagrams: For power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For pumps and controls, to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect bearings and couplings against damage.

C. Comply with pump manufacturer's written rigging instructions for handling.

1.6 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 SUBMERSIBLE EFFLUENT PUMPS

A. Submersible, Fixed-Position, Single-Seal Effluent Pumps:
   1. Description: Factory-assembled and -tested effluent-pump unit.
   2. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal effluent pump as defined in HI 1.1-1.2 and HI 1.3.
   3. Pump Casing: Cast iron, with open inlet, legs that elevate pump to permit flow into impeller, and vertical discharge for piping connection.
   4. Impeller: Statically and dynamically balanced, ASTM A 48/A 48M, Class No. 25 A cast iron, closed or semi-open design for clear wastewater, and keyed and secured to shaft.
   5. Pump and Motor Shaft: Stainless steel, with factory-sealed, grease-lubricated ball bearings.
   6. Seal: Mechanical.
   7. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
   8. Controls:
      a. Enclosure: NEMA 250, Type 1; wall-mounted.
      b. Switch Type: Mechanical-float type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
      c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
      d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with mechanical-float, mercury-float, or pressure switch matching control and electric bell; 120-V ac, with transformer and contacts for remote alarm bell.
   9. Control-Interface Features:
      a. Remote Alarm Contacts: For remote alarm interface.
      b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:
         1) On-off status of pump.
         2) Alarm status.

B. Submersible, Quick-Disconnect, Single-Seal Effluent Pumps:
   1. Description: Factory-assembled and -tested effluent-pump unit with guide-rail supports.
   2. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal effluent pump as defined in HI 1.1-1.2 and HI 1.3.
   3. Pump Casing: Cast iron, with open inlet, and discharge fittings for connection to guide-rail support.

4. Impeller: Statically and dynamically balanced, ASTM A 48/A 48M, Class No. 25 A cast iron ASTM B 584, cast bronze andstainless steel, closed or semiopen design for clear wastewater, and keyed and secured to shaft.
5. Pump and Motor Shaft: Stainless steel, with factory-sealed, grease-lubricated ball bearings.
6. Seal: Mechanical.
7. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
8. Controls:
    a. Enclosure: NEMA 250, Type 1; wall-mounted.
    b. Switch Type: Mechanical-float type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
    c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
    d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with mechanical-float, mercury-float, or pressure switch matching control and electric bell; 120-V ac, with transformer and contacts for remote alarm bell.
9. Control-Interface Features:
    a. Remote Alarm Contacts: For remote alarm interface.
    b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:
        1) On-off status of pump.
        2) Alarm status.
10. Guide-Rail Supports:
    a. Standard: SWPA's "Submersible Sewage Pumping Systems (SWPA) Handbook."
    b. Guide Rails: Vertical pipes or structural members, made of galvanized steel or other corrosion-resistant metal, attached to baseplate and basin sidewall or cover.
    c. Baseplate: Corrosion-resistant metal plate, attached to basin floor, supporting guide rails and stationary elbow.
    d. Pump Yoke: Motor-mounted or casing-mounted yokes or other attachments for aligning pump during connection of flanges.
    e. Movable Elbow: Pump discharge-elbow fitting with flange, seal, and positioning device.
    f. Stationary Elbow: Fixed discharge-elbow fitting with flange that mates to movable-elbow flange and support attached to baseplate.
    g. Lifting Cable: Stainless steel; attached to pump and cover at manhole.

2.2 SUBMERSIBLE SEWAGE PUMPS

A. Submersible, Quick-Disconnect, Single-Seal Sewage Pumps:
   1. Description: Factory-assembled and -tested sewage-pump unit with guide-rail supports.
   2. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sewage pump as defined in HI 1.1-1.2 and HI 1.3.
   3. Pump Casing: Cast iron, with open inlet, and discharge fittings for connection to guide-rail support.
   4. Impeller: Statically and dynamically balanced, ASTM A 48/A 48M, Class No. 25 A cast iron ASTM B 584, cast bronze and stainless steel, nonclog, open, or semiopen design for solids handling, and keyed and secured to shaft.
   5. Pump and Motor Shaft: Stainless steel, with factory-sealed, grease-lubricated ball bearings.
   6. Seal: Mechanical.
   7. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
   8. Controls:
      a. Enclosure: NEMA 250, Type 1; wall-mounted.
      b. Switch Type: Mechanical-float type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
      c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
      d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with mechanical-float, mercury-float, or pressure switch matching control and electric bell; 120-V ac, with transformer and contacts for remote alarm bell.
   9. Control-Interface Features:
      a. Remote Alarm Contacts: For remote alarm interface.
      b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:
         1) On-off status of pump.
         2) Alarm status.
   10. Guide-Rail Supports:
      a. Standard: SWPA's "Submersible Sewage Pumping Systems (SWPA) Handbook."
      b. Guide Rails: Vertical pipes or structural members, made of galvanized steel or other corrosion-resistant metal, attached to baseplate and basin sidewall or cover.
      c. Baseplate: Corrosion-resistant metal plate, attached to basin floor, supporting guide rails and stationary elbow.
      d. Pump Yoke: Motor-mounted or casing-mounted yokes or other attachments for aligning pump during connection of flanges.

e. Movable Elbow: Pump discharge-elbow fitting with flange, seal, and positioning device.
f. Stationary Elbow: Fixed discharge-elbow fitting with flange that mates to movable-elbow flange and support attached to baseplate.
g. Lifting Cable: Stainless steel; attached to pump and cover at manhole.

B. Submersible, Quick-Disconnect, Grinder Sewage Pumps:
1. Description: Factory-assembled and -tested, grinder sewage-pump unit with guide-rail supports.
2. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sewage pump as defined in HI 1.1-1.2 and HI 1.3.
3. Pump Casing: Cast iron, with open inlet, and discharge fittings for connection to guide-rail supports.
4. Impeller: Bronze or stainless steel; statically and dynamically balanced, with stainless-steel cutter, grinder, or slicer assembly; capable of handling solids; and keyed and secured to shaft.
5. Pump and Motor Shaft: Stainless steel, with factory-sealed, grease-lubricated ball bearings.
6. Seal: Mechanical.
7. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
8. Controls:
a. Enclosure: NEMA 250, Type 1; wall-mounted.
b. Switch Type: Mechanical-float type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with mechanical-float, mercury-float, or pressure switch matching control and electric bell; 120-V ac, with transformer and contacts for remote alarm bell.
9. Control-Interface Features:
a. Remote Alarm Contacts: For remote alarm interface.
b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:
1) On-off status of pump.
2) Alarm status.
10. Guide-Rail Supports:
a. Standard: SWPA's "Submersible Sewage Pumping Systems (SWPA) Handbook."
b. Guide Rails: Vertical pipes or structural members, made of galvanized steel or other corrosion-resistant metal, attached to baseplate and basin sidewall or cover.

c. Baseplate: Corrosion-resistant metal plate, attached to basin floor, supporting guide rails and stationary elbow.
d. Pump Yoke: Motor-mounted or casing-mounted yokes or other attachments for aligning pump during connection of flanges.
e. Movable Elbow: Pump discharge-elbow fitting with flange, seal, and positioning device.
f. Stationary Elbow: Fixed discharge-elbow fitting with flange that mates to movable-elbow flange and support attached to baseplate.
g. Lifting Cable: Stainless steel; attached to pump and cover at manhole.

2.3 SEWAGE-PUMP BASINS AND BASIN COVERS

A. Basins: Factory-fabricated, watertight, cylindrical, basin sump with top flange and sidewall openings for pipe connections.
   1. Material: Fiberglass.
   2. Reinforcement: Mounting plates for pumps, fittings, guide-rail supports if used, and accessories.
   3. Anchor Flange: Same material as or compatible with basin sump, cast in or attached to sump, in location and of size required to anchor basin in concrete slab.

B. Basin Covers: Fabricate metal cover with openings having gaskets, seals, and bushings; for access to pumps, pump shafts, control rods, discharge piping, vent connections, and power cables.
   1. Reinforcement: Steel or cast iron, capable of supporting foot traffic for basins installed in foot-traffic areas.
   2. Mounting attachment to concrete included.

2.4 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 22 05 13 "Common Motor Requirements for Plumbing Equipment."
   1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Motors for submersible pumps shall be hermetically sealed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for plumbing piping to verify actual locations of sanitary drainage and vent piping connections before sewage pump installation.

3.2 INSTALLATION

A. Pump Installation Standards:
   1. Comply with HI 1.4 for installation of centrifugal pumps.
   2. Comply with HI 3.1-3.5 for installation of progressing-cavity sewage pumps.

B. Equipment Mounting:
   1. Install progressing-cavity sewage pumps on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Division 03.
   2. Comply with requirements for vibration isolation and seismic control devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment"

C. Wiring Method: Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 CONNECTIONS

A. Comply with requirements for piping specified in Section 22 13 16 "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:
   1. Perform each visual and mechanical inspection.
   2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Pumps and controls will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust pumps to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust control set points.

END OF SECTION 22 13 29

SECTION 22 33 00

ELECTRIC, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Flow-control, electric, tankless, domestic-water heaters.
   2. Domestic-water heater accessories.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Commercial domestic-water heaters shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 ACTION SUBMITTALS

A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Sustainable Design Submittals:
   1. LEED Submittal Requirements: Submit for Sustainability Consultant's review.
      a. List of all adhesives and sealants installed on the project, within the LEED boundary that were included in the contract.
      b. Cost breakdowns for the materials included in the Contractor or sub-contractor's work. Cost breakdowns shall include total cost plus itemized material costs.
      c. A total estimated weight (lbs.) value of the material applied within the LEED project boundary.
      d. IEQ credit 4, Low Emitting Materials: The VOC content in g/L or applicable certification label for each adhesives, sealants, coatings, paints, etc. per respective LEED requirement.
   2. GBMCF Back-Up Documentation: These documents are used to validate the information provided on the GBMCF (except cost data). For each material listed

on the GBMCF, provide documentation to certify the material's attributes, as applicable:

a. IEQ credit 4, Low Emitting Materials: VOC content or applicable certification label proof in the form of a cutsheet, MSDS, or letter from the manufacturer.
b. Product cut sheets for materials appearing in the GBMCF. Cut sheets shall be submitted with the Contractor or sub-contractor's stamp, as confirmation that the submitted products are the products installed on the Project.

3. Contractor is required to collect all LEED submittal documentation from the project's subcontractors and assemble into one (1) package per Section or trade, on the GBMCF provided, for review by the Sustainability Consultant. Submit GBMCF and Back-Up Documentation within 30 days of awarded contract. Incomplete or inaccurate LEED submittals may be used as the basis for rejecting the submitted products or assemblies.

C. Shop Drawings:
1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For commercial domestic-water heaters, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Product Certificates: For each type of tankless, electric, domestic-water heater, from manufacturer.

C. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

D. Source quality-control reports.

E. Field quality-control reports.

F. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For electric, domestic-water heaters to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including storage tank and supports.
      b. Faulty operation of controls.
      c. Deterioration of metals, metal finishes, and other materials beyond normal use.
   2. Warranty Periods: From date of Substantial Completion.
      a. Electric, Tankless, Domestic-Water Heaters: Two year(s).

PART 2 - PRODUCTS

2.1 LEED MATERIAL PERFORMANCE

A. IEQ credit 4.1 - Low Emitting Adhesives & Sealants
   1. Adhesives, Sealants and Sealant Primers must comply with South Coast Air Quality Management District (SCAQMD) Rule #1168. Volatile organic compound (VOC) limits listed in the table below correspond to an effective date of July 1, 2005 and rule amendment date of January 7, 2005.
   2. Aerosol Adhesives must comply with Green Seal Standard for Commercial Adhesives GS-36 requirements in effect on October 19, 2000.

B. IEQ credit 4.2 - Low Emitting Paints & Coatings
   1. ALL associated site-applied adhesives, grouts, finishes and sealers must be compliant with the respective requirements of IEQc4.1, Adhesives & Sealants and IEQc4.2, Paints & Coatings.

2.2 ELECTRIC, TANKLESS, DOMESTIC-WATER HEATERS

A. Flow-Control, Electric, Tankless, Domestic-Water Heaters:
   1. Manufacturers: Subject to compliance with requirements, provide product by:
      a. Bradford White
   2. Standard: UL 499 for electric, tankless, (domestic-water heater) heating appliance.
   3. Construction: Copper piping or tubing complying with NSF 61 Annex G barrier materials for potable water, without storage capacity.
      a. Connections: ASME B1.20.1 pipe thread.
      b. Pressure Rating: 150 psig (1035 kPa).
      c. Heating Element: Resistance heating system.
      d. Temperature Control: Flow-control fitting.
      e. Safety Control: High-temperature-limit cutoff device or system.
      f. Jacket: Aluminum or steel with enameled finish or plastic.
   4. Support: Bracket for wall mounting.
   5. Capacity and Characteristics:
      a. Refer to Schedules.

2.3 DOMESTIC-WATER HEATER ACCESSORIES

A. Air Precharge Pressure: Factory precharged.

B. Refer to Schedules.

C. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 (DN 20) with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.

D. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.

E. Heat-Trap Fittings: Water heater manufacturer factory supplied.

F. Manifold Kits: Domestic-water heater manufacturer's factory-fabricated inlet and outlet piping for field installation, for multiple domestic-water heater installation. Include ball-, butterfly-, or gate-type shutoff valves to isolate each domestic-water heater and calibrated balancing valves to provide balanced flow through each domestic-water heater.
   1. Comply with requirements for ball-, butterfly-, or gate-type shutoff valves specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping," and Section 22 05 23.13 "Butterfly Valves for Plumbing Piping."
   2. Comply with requirements for balancing valves specified in Section 22 11 19 "Domestic Water Piping Specialties."

G. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

2.4 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test commercial domestic-water heaters to minimum of one and one-half times pressure rating before shipment.

C. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Division 01 for requirements for correcting work.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Electric, Tankless, Domestic-Water Heater Mounting: Install electric, tankless, domestic-water heaters at least 18 inches (457 mm) above floor on wall bracket.
   1. Maintain manufacturer's recommended clearances.
   2. Arrange units so controls and devices that require servicing are accessible.
   3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   4. Install anchor bolts to elevations required for proper attachment to supported equipment.
   5. Anchor domestic-water heaters to substrate.

B. Install electric, domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
   1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping," and Section 22 05 23.13 "Butterfly Valves for Plumbing Piping."

C. Install commercial, electric, domestic-water heaters with seismic-restraint devices. Comply with requirements for seismic-restraint devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

D. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for electric, domestic-water heaters that do not have tank drains. Comply with

requirements for hose-end drain valves specified in Section 22 11 19 "Domestic Water Piping Specialties."

E. Install thermometers on outlet piping of electric, domestic-water heaters. Comply with requirements for thermometers specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."

F. Assemble and install inlet and outlet piping manifold kits for multiple electric, domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each electric, domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each electric, domestic-water heater outlet. Comply with requirements for valves specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping," and Section 22 05 23.13 "Butterfly Valves for Plumbing Piping," and comply with requirements for thermometers specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."

G. Install piping-type heat traps on inlet and outlet piping of electric, domestic-water heater storage tanks without integral or fitting-type heat traps.

H. Fill electric, domestic-water heaters with water.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 22 11 16 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
   2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with Division 01 requirements for retesting and re-inspecting requirements and requirements for correcting the Work.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water heaters.

END OF SECTION 22 33 00

SECTION 22 42 13.13

COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Water closets.
   2. Flushometer valves.
   3. Toilet seats.
   4. Supports.

1.2 DEFINITIONS

A. Effective Flush Volume: Average of two reduced flushes and one full flush per fixture.

B. Remote Water Closet: Located more than 30 feet from other drain line connections or fixture and where less than 1.5 drainage fixture units are upstream of the drain line connection.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water closets.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Sustainable Design Submittals:
   1. Product Data: For water consumption.

C. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.
   1. Flushometer-Valve Repair Kits: As required by Owner.

PART 2 - PRODUCTS

2.1 WALL-MOUNTED WATER CLOSETS

A. Water Closets: Wall mounted, top spud, accessible.
   1. Bowl:
      a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
      b. Material: Vitreous china.
      c. Type: Siphon jet.
      d. Style: Flushometer valve.
      e. Height: Standard.
      f. Rim Contour: Elongated.
      g. Water Consumption: 1.28 gal. per flush.
      h. Spud Size and Location: NPS 1-1/2; top.
   2. Support: Water closet carrier
   3. Water-Closet Mounting Height: Standard or Handicapped/elderly according to ICC/ANSI A117.1 (Refer to plans for locations of ADA toilets.)
   4. MaP Score = 1,000

2.2 FLUSHOMETER VALVES

A. Solenoid-Actuator, Diaphragm Flushometer Valves:
   1. Standard: ASSE 1037.
   2. Minimum Pressure Rating: 125 psig.
   3. Features: Include integral check stop and backflow-prevention device.
   4. Material: Brass body with corrosion-resistant components.
   5. Exposed Flushometer-Valve Finish: Chrome plated.
   6. Panel Finish: Chrome plated or stainless steel.
   7. Style: Exposed.
   8. Actuator: Solenoid complying with UL 1951, and listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   9. Trip Mechanism: Battery powered electronic sensor complying with UL 1951, and listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   10. Consumption: 1.28 gal. per flush.
   11. Minimum Inlet: NPS 1.
   12. Minimum Outlet: NPS 1-1/4.
   13. MaP Score = 1,000

2.3 TOILET SEATS

A. Toilet Seats:
   1. Standard: IAPMO/ANSI Z124.5.
   2. Material: Plastic.
   3. Type: Commercial (Standard).

4. Shape: Elongated rim, open front.
5. Hinge: Self-sustaining.
6. Hinge Material: Noncorroding metal.
7. Seat Cover: Not required.
8. Color: White.

2.4 SUPPORTS

A. Water Closet Carrier:
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. Zurn Industries, LLC.
      b. J.R. Smith
   2. Standard: ASME A112.6.1M.
   3. Description: Waste-fitting assembly, as required to match drainage piping material and arrangement with faceplates, couplings gaskets, and feet; bolts and hardware matching fixture.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.

B. Examine walls and floors for suitable conditions where water closets will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Water-Closet Installation:
   1. Install level and plumb according to roughing-in drawings.
   2. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:
   1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
   2. Use carrier supports with waste-fitting assembly and seal.
   3. Install floor-mounted, back-outlet water closets attached to building floor substrate, onto waste-fitting seals; and attach to support.
   4. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.

C. Flushometer-Valve Installation:
   1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
   2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
   3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
   4. Install actuators in locations that are easy for people with disabilities to reach.
   5. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

D. Install toilet seats on water closets.

E. Wall Flange and Escutcheon Installation:
   1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
   2. Install deep-pattern escutcheons if required to conceal protruding fittings.
   3. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

F. Joint Sealing:
   1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
   2. Match sealant color to water-closet color.
   3. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."

3.3 CONNECTIONS

A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.

B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.4 ADJUSTING

A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed water closets and fittings.

C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 42 13.13

SECTION 22 42 13.16

COMMERCIAL URINALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Urinals.
   2. Flushometer valves.
   3. Supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for urinals.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Sustainable Design Submittals:
   1. Product Data: For water consumption.

C. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.
   1. Flushometer-Valve Repair Kits: Provide quantity as required by Owner.

PART 2 - PRODUCTS

2.1 WALL-HUNG URINALS

A. Urinals: Wall hung, back outlet.
   1. Fixture:
      a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
      b. Material: Vitreous china.
      c. Strainer or Trapway: Manufacturer's standard strainer with integral trap.
      d. Water Consumption: Water saving.
      e. Spud Size and Location: NPS 3/4; top.

f. Outlet Size and Location: 2" IPS; back.
g. Color: White.

2. Waste Fitting:
   a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
   b. Size: NPS 2.
3. Support: Type I Urinal Carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include rectangular, steel uprights..
4. Urinal Mounting Height: Standard of Handicapped/elderly according to ICC A117.1 (Refer to drawings for ADA designation).

2.2 URINAL FLUSHOMETER VALVES

A. Solenoid-Actuator, Solar, Diaphragm Flushometer Valves:
   1. Standard: ASSE 1037.
   2. Minimum Pressure Rating: 125 psig.
   3. Features: Include integral check stop and backflow-prevention device.
   4. Material: Brass body with corrosion-resistant components.
   5. Exposed Flushometer-Valve Finish: Chrome plated.
   6. Panel Finish: Chrome plated or stainless steel.
   7. Actuator: Solenoid complying with UL 1951; listed and labeled as defined in NFPA 70, by a qualified testing agency; and marked for intended location and application.
   8. Trip Mechanism: Battery-powered and solar electronic sensor complying with UL 1951; listed and labeled as defined in NFPA 70, by a qualified testing agency; and marked for intended location and application.
   9. Consumption: 0.125 gal. per flush.
   10. Inlet: NPS 3/4.

2.3 SUPPORTS

A. Type I Urinal Carrier:
   1. Standard: ASME A112.6.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before urinal installation.

B. Examine walls and floors for suitable conditions where urinals will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Urinal Installation:
   1. Install urinals level and plumb according to roughing-in drawings.
   2. Install wall-hung, back-outlet urinals onto waste fitting seals and attached to supports.
   3. Install accessible, wall-mounted urinals at mounting height for the handicapped/elderly, according to ICC/ANSI A117.1.
   4. Install trap-seal liquid in waterless urinals.

B. Support Installation:
   1. Install supports, affixed to building substrate, for wall-hung urinals.
   2. Use off-floor carriers with waste fitting and seal for back-outlet urinals.
   3. Use carriers without waste fitting for urinals with tubular waste piping.
   4. Use chair-type carrier supports with rectangular steel uprights for accessible urinals.

C. Flushometer-Valve Installation:
   1. Install flushometer-valve water-supply fitting on each supply to each urinal.
   2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
   3. Install lever-handle flushometer valves for accessible urinals with handle mounted on open side of compartment.
   4. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

D. Wall Flange and Escutcheon Installation:
   1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations.
   2. Install deep-pattern escutcheons if required to conceal protruding fittings.
   3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

E. Joint Sealing:
   1. Seal joints between urinals and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
   2. Match sealant color to urinal color.
   3. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."

3.3 CONNECTIONS

A. Connect urinals with water supplies and soil, waste, and vent piping. Use size fittings required to match urinals.

B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to urinals, allow space for service and maintenance.

3.4 ADJUSTING

A. Operate and adjust urinals and controls. Replace damaged and malfunctioning urinals, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

A. Clean urinals and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed urinals and fittings.

C. Do not allow use of urinals for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 42 13.16

SECTION 22 42 16.13

COMMERCIAL LAVATORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Lavatories.
   2. Faucets.
   3. Supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Sustainable Design Submittals:
   1. Product Data: For water consumption.

C. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.
   1. In addition to items specified in Division 01 include the following:
      a. Servicing and adjustments of automatic faucets.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
   2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 VITREOUS-CHINA, COUNTER-MOUNTED LAVATORIES, UNDER COUNTER MOUNT

A. Lavatory: Rectangular, self-rimming, vitreous china, counter mounted.
   1. Fixture:
      a. Standard: ASME A112.19.2/CSA B45.1.
      b. Type: Self-rimming for above-counter mounting.
      c. Nominal Size: Oval, 19 by 16 inches.
      d. Faucet-Hole Punching: see schedule.
      e. Faucet-Hole Location: Top.
      f. Color: White.
      g. Mounting Material: Sealant.
   2. Faucet: Solar powered, 0.35-gpm (see schedule)

B. Manufacturer:
   1. American Standard
   2. Kohler
   3. Or approved equal

2.2 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

A. Lavatory: Vitreous china, wall mounted, with back.
   1. Fixture:
      a. Standard: ASME A112.19.2/CSA B45.1.
      b. Type: For wall hanging.
      c. Nominal Size: Rectangular, 21 by 19 inches.
      d. Faucet-Hole Punching: see schedule.
      e. Faucet-Hole Location: Top.
      f. Color: White.
      g. Mounting Material: Chair carrier.
   2. Faucet: sensor-operated electronic (see schedule)
   3. Support: Type I, exposed-arm lavatory carrier. Include rectangular, steel uprights.
   4. Lavatory Mounting Height: Standard or Handicapped/elderly according to ICC A117.1. (Refer to drawings for locations of ADA fixtures.)

B. Manufacturer:
   1. American Standard
   2. Kohler
   3. Or approved equal

2.3 PENAL COMBY LAVATORY (HOLDING CELL)

A. See Section 22 42 13.13.

2.4 SOLID-BRASS, AUTOMATICALLY OPERATED LAVATORY FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Lavatory Faucets: Automatic-type, battery-powered, solar, electronic-sensor-operated, mixing, solid-brass valve.
   1. Standards: ASME A112.18.1/CSA B125.1 and UL 1951.
   2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
   4. Body Type: Single hole.
   5. Body Material: Commercial, solid brass.
   6. Finish: Polished chrome plate.
   7. Maximum Flow Rate: 0.35 gpm Insert value.
   8. Mounting Type: Deck, concealed.
   9. Spout: Rigid type.
   10. Spout Outlet: Aerator.
   11. Drain: Not part of faucet.

2.5 SUPPORTS

A. Type II Lavatory Carrier:
   1. Standard: ASME A112.6.1M.

2.6 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.

D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Loose key.

F. Risers:
   1. NPS 3/8.

2. Chrome-plated, rigid-copper-pipe and brass straight or offset tailpieces riser.

2.7 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.

C. Trap:
1. Size: NPS 1-1/4.
2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated, brass or steel wall flange.
3. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch-thick stainless-steel tube to wall; and stainless-steel wall flange.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.

B. Examine counters and walls for suitable conditions where lavatories will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install lavatories level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-mounted lavatories.

C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.

D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

E. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 22 07 19 "Plumbing Piping Insulation."

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

A. After completing installation of lavatories, inspect and repair damaged finishes.

B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed lavatories and fittings.

D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 42 16.13

SECTION 22 42 16.16

COMMERCIAL SINKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Service sinks.
   2. Utility sinks.
   3. Handwash sinks.
   4. Sink faucets.
   5. Supply fittings.
   6. Waste fittings.
   7. Supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sinks.
   2. Include rated capacities, operating characteristics, electrical characteristics and furnished specialties and accessories.

B. Sustainable Design Submittals:
   1. Product Data: For water consumption.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sinks to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
   2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 SERVICE BASINS

A. Service Basins: Terrazzo, floor mounted.
   1. Fixture:
      a. Standard: IAPMO PS 99.
      b. Shape: Square.
      c. Nominal Size: 24 by 24 inches.
      d. Height: 12 inches with dropped front.
      e. Tiling Flange: Not required.
      f. Rim Guard: On front top surfaces.
      g. Color: Not applicable.
      h. Drain: Grid with NPS 2 outlet.
   2. Mounting: On floor and flush to wall.
   3. Faucet: Manufacturer's standard mop basin faucet with threaded hose connection.

2.2 UTILITY SINKS

A. Utility Sinks: Stainless steel, counter mounted.
   1. Fixture:
      a. Standard: ASME A112.19.3/CSA B45.4.
      b. Type: Ledge back.
      c. Number of Compartments: One.
      d. Overall Dimensions:
      e. Metal Thickness: 0.050 inch.
      f. Compartment:
         1) Dimensions:
         2) Drain: Grid with NPS 1-1/2 tailpiece and twist drain.
         3) Drain Location: Near back of compartment.
      g. Each Compartment:
         1) Dimensions:
         2) Drains: Grid with NPS 1-1/2 tailpiece and twist drain.
         3) Drain Location: Near back of compartment.
   2. Faucet(s):
      a. Number Required: One.
      b. Mounting: On ledge.
      c. Flow Rate: 1.0-gpm
   3. Supply Fittings:
      a. Standard: ASME A112.18.1/CSA B125.1.
      b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.
         1) Operation: Wheel handle.
         2) Risers: NPS 1/2, chrome-plated, rigid-copper pipe.
   4. Waste Fittings:
      a. Standard: ASME A112.18.2/CSA B125.2.

b. Trap(s):
   1) Size: NPS 1-1/2.
   2) Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated brass or steel wall flange.
c. Continuous Waste:
   1) Size: NPS 1-1/2.
   2) Material: Chrome-plated, 0.032-inch-thick brass tube.

5. Mounting: On counter with sealant.

2.3 HANDWASH SINKS

A. Handwash Sinks: Stainless steel, wall mounted.
   1. Fixture:
      a. Standards: ASME A112.19.3/CSA B45.4 and NSF/ANSI 2.
      b. Type: Basin with radius corners, back for faucet, and support brackets.
      c. Nominal Size: 17 by 16 by 5 inches.
   2. Faucet: 0.35-gpm
   3. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
   4. Waste Fittings: Comply with requirements in "Waste Fittings" Article.
   5. Support: Type II sink carrier..
   6. Lavatory Mounting Height: Standard or Handicapped/elderly according to ICC A117.1. (Refer to drawings for locations of ADA fixtures)

2.4 SINK FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet-spout materials that will be in contact with potable water.

B. Sink Faucets: Manual type, single-control mixing valve.
   1. Standard: ASME A112.18.1/CSA B125.1.
   2. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
   3. Body Type: Centerset.
   4. Body Material: Commercial, solid brass.
   5. Finish: Chrome plated.
   6. Maximum Flow Rate: 1.0 gpm.
   7. Handle(s): Lever.
   8. Mounting Type: Deck, concealed.
   9. Spout Type: Rigid, solid brass.
   10. Vacuum Breaker: Not required for hose outlet.
   11. Spout Outlet: Aerator.

2.5 SUPPORTS

A. Type II Sink Carrier:
   1. Standard: ASME A112.6.1M.

2.6 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass or stainless-steel wall flange.

D. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Risers:
   1. NPS 1/2.
   2. Chrome-plated, rigid-copper pipe.

2.7 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/2 offset and straight tailpiece.

C. Trap:
   1. Size: NPS 1-1/2.
   2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated brass or steel wall flange.
   3. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch-thick stainless-steel tube to wall; and stainless-steel wall flange.

2.8 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.9 SUPPORTS

A. Water Closet Carrier:
   1. Standard: ASME A112.6.1M.
   2. Description: Waste-fitting assembly, as required to match drainage piping material and arrangement with faceplates, couplings gaskets, and feet; bolts and hardware matching fixture.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.

B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sinks level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-hung sinks.

C. Install accessible wall-mounted sinks at handicapped/elderly mounting height according to ICC/ANSI A117.1.

D. Set floor-mounted sinks in leveling bed of cement grout.

E. Install water-supply piping with stop on each supply to each sink faucet.
   1. Exception: Use ball or gate valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping."
   2. Install stops in locations where they can be easily reached for operation.

F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

G. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."

H. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 22 07 19 "Plumbing Piping Insulation."

3.3 CONNECTIONS

A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of sinks, inspect and repair damaged finishes.

B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed sinks and fittings.

D. Do not allow use of sinks for temporary facilities unless approved in writing by County.

END OF SECTION 22 42 16.16

SECTION 23 05 00

HVAC AND PLUMBING GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01

B. The requirements of the General Conditions and Supplementary Conditions

1.2 SUMMARY

A. Furnish and install a complete (fully tested, adjusted, and ready for operation) mechanical system, including plumbing system and fully automatic indoor space thermal conditioning and ventilation (commonly "HVAC") system with associated controls as described by the Contract Drawings and Specifications.

B. The HVAC systems and design described in the Project documents reflect a building designed for low consumption of energy and water and minimum environmental footprint. Any modifications to the systems described herein shall maintain or improve on the sustainability and energy efficiency features of the project.

C. All design modifications that pertain to system selection, system energy efficiency and energy use, material selection and indoor air quality issues shall require the approval of Integral Group.

D. Include incidental details not usually shown or specified, but necessary for proper installation and operation.

E. Check, verify, and coordinate Work with Drawings and Specifications prepared by all other trades. Include modifications, relocations, and adjustments necessary to complete work or avoid interference with other trades.

F. Where architectural features govern location of Work, refer to Architectural Drawings.

G. Contractor may install additional piping, fittings, and valves, not shown on the drawings, for testing purposes or convenience of installation. Where such materials are installed, they shall comply with the specifications and shall be properly sized for the system and operation. Remove such installed materials when they interfere with design conditions or as directed by the County's Representative.

H. LEED: This building shall be LEED certified. Contractor and their subs shall provide all relevant support documentation pertaining to the LEED credits that relate to their work.

I. Commissioning: The scope of work for the Contractor shall not include the duties of the Commissioning Authority. Contractor will be required, however, to include in their scope of work duties relevant to the commissioning process, including but not limited to training of owner's personnel in the operation of the HVAC and plumbing equipment, providing manufacturer's startup and pre-functional checklists and contractor-provided pre-functional and startup checklists to Commissioning Authority, performing and documenting pre-functional tests for HVAC and plumbing equipment, performing and documenting functional tests for HVAC and plumbing equipment, supporting DDC Contractor and Test and Balance Contractor in the performance of their duties, and providing operations and maintenance manuals.

1.3 CODES AND STANDARDS

A. All work and materials shall be in full accordance with the latest local rules and regulations, applicable sections of the California Code of Regulations, Title 24, State Fire Marshal, the Safety Orders of the Division of Industrial Safety, the California Electric Code and applicable State requirements. Nothing in these Plans and Specifications is to be construed to permit work not conforming to these requirements.

B. Wherever the Specifications call for or describe materials or construction of better quality or larger sizes than are required by the above rules and regulations, these Specifications shall govern. Should there be any direct conflict between the above rules and regulations and the Specifications the rules shall govern.

C. Equipment shall have U.L. label listing.

1.4 DRAWINGS

A. Layout of the equipment and work is diagrammatic, unless specifically dimensioned. Drawings and details shall be checked for interferences before installing the work. Any interference noted between different drawings, and between drawings and actual field conditions shall be brought to the attention of the County’s Representative of Record for a decision. The right is reserved to make any reasonable change in location of equipment without additional expense to the County.

B. For purposes of clarity and legibility, drawings are diagrammatic to the extent that many offsets, bends, special fittings, exact locations of items are not indicated, unless specifically dimensioned. Exact routing of piping and ductwork and locations of equipment shall be governed by structural conditions and obstructions. Contractor shall make use of all data in Contract Drawings and Specifications and field conditions.

C. In the event a major re-routing of a system appears necessary, Contractor shall prepare and submit for approval, shop drawings of the proposed rearrangement. Because of the diagrammatic nature and small scale of the Contract Drawings, all necessary offsets, adjustments, and transitions required for the complete installation are not shown.

Contractor shall carefully investigate the structural and finish conditions affecting all the Work and shall arrange such Work accordingly, furnishing such fittings, equipment, accessories, etc., as may be required to meet such conditions, at no increase in Contract Sum.

D. The construction documents for this project were prepared by the design team using BIM (Building Information Modeling). Using this software by the design team does not relieve the Contractor from performing the necessary coordination to provide complete, code compliant and operational building systems. The plans and sections provided are not complete and are to be considered diagrammatic only. The exact location of the piping, ductwork, electrical and support components are to be determined by the Contractor. All building sections and details provided are for information only and do not relieve the Contractor from performing final coordination. Contractor is responsible for coordinating with all other trades.

E. All dimensions and locations of equipment, doors, partitions, etc., are to be taken from the architectural plans but shall be verified at the site.

1.5 SUBMITTALS

A. See Section 01 30 00 Submittal Procedures, for submittal procedures.

B. Mechanical, plumbing and related submittals are in addition subject to the requirements of this Article. In the event of a conflict between the requirements of Section 01 30 00 and this Article, the requirements of this Article shall supersede and take precedence over those of Section 01 30 00.

C. For DDC Building Automation Systems, see also SUBMITTALS in Part 1 of Section 23 09 00 for additional submittal requirements and a detailed submittal schedule.

D. County's Representative of Record will review submittals and provide comments within the following timeframe after receipt by the County's Representative:
   1. For typical submittals, allow 10 working days.
   2. For large or complex submittals, allow 15 working days. Determination of "large and complex" submittal shall be at the discretion of the County's Representative.
   3. Do not send County's Representative more than 10 submittals in a contiguous period of 5 working days. If excess submittals are received, review period will be extended as necessary to perform proper review. Submittals will be reviewed in priority determined by County's Representative in consultation with Contractor.
   4. These submittal review periods supersede and take precedence over periods defined in Section 013000, unless Section 013000 allows for longer review periods.
   5. Submittal review periods shall not be reduced from the times herein except by agreement with the reviewing entity, in advance and in writing.

E. Submittal documentation and drawings shall consistently use the same abbreviations, symbols, nomenclature and identifiers. Use the same identifiers (e.g. equipment tags) used in Contract Drawings.

F. Submittals shall be provided in digital format.
   1. Provide a separate file for each submittal. For submittal packages, provide a separate file for each subsection (e.g. hardware cutsheets and shop drawings for the same Section shall be provided as separate files).
   2. Product cutsheets, test forms and other text documents shall be provided in word-searchable digital format. Acceptable formats are MS Word, PDF (generated from another electronic document and word-searchable; scans of paper documents are not acceptable), and HTML; other formats require approval prior to submission.
   3. Drawings and schematics shall be provided in PDF format and in AutoCAD-compatible format.
   4. Scanned paper documents are not acceptable
      a. Exception: original signed documents, such as qualifications, inspection certificates, and warranty documents.
   5. Hardcopy (paper) submittals are not acceptable and shall not be provided except as noted in Article 1.20).
   6. Submittals provided in the wrong format will be returned without action.

G. Submission and Resubmission Procedure
   1. Optional Pre-Submittals: At Contractor's option, material may be submitted unofficially via email directly to the County's Representative for review and comment prior to formal submission. Comments provided by the County's Representative are not official and may be changed or additional comments may be provided on the formal submittal. The intent of pre-submittals is to reduce paperwork and review time, and to provide a venue to discuss technologies, products, designs or implementation strategies that are novel or unique.
   2. Each submittal shall have a unique serial number that includes the associated Specification Section followed by a number for each sub-part of the submittal for that Specification Section, such as SUBMITTAL 230800-01. There is no requirement to assign particular serial numbers to any specific submittals – serial number assignment is arbitrary. The only requirements are that the serial numbers be sequential (to avoid confusing gaps) and, most importantly, consistent across all submittal correspondence.
   3. Each resubmittal shall have the original unique serial number plus unique revision number such as SUBMITTAL 230800-01 REVISION 1.
   4. Submit one copy of submittal in electronic format specified in Paragraph 1.5F. Submissions made in the wrong format will be returned without action.
   5. Include with each submittal and resubmittal a copy of the relevant specification section(s) noting on each paragraph and sub-paragraph(s) the following:
      a. **CONFORMS:** Contractor has verified that the submitted product conforms to the noted requirement(s).

b. **CONFORMS AS NOTED:** Contractor has verified that the submitted product conforms to the noted requirement(s) by means of being equal to or higher quality and / or performance.
c. **NON-CONFORM:** Contractor has verified that the submitted product does not conform to the noted requirement(s) and delineates each deviation from the specification requirements.
d. **NOT APPLICABLE:** Contractor has verified that the noted requirement(s), in their opinion do not apply to this product, delineating the reasons for this decision.
e. Include with each submittal and resubmittal a copy of the relevant specification section(s) the printed name of the contractor reviewer, their signature, the company name, and date of review.

6. Revise submittal
   a. Respond to all comments:
      1) Revise initial submittal to resolve review comments and corrections.
      2) Provide complete responses to comments or suggestions which are not practical to implement in the opinion of the Contractor.
   b. Indicate any changes that have been made other than those requested.
   c. Clearly identify resubmittal by original submittal number and revision number.
   d. Resubmittals that are not responsive to all comments will be returned without action.
7. Resubmit revised submittals until no exceptions are taken.
8. Once submittals are accepted with “No Exceptions Taken” or “Approved As Noted”, provide:
   a. Complete submittal of all accepted drawings and products in a single electronic file.
   b. Copies for coordination with other trades, if and as required by the General Contractor or County’s Representative.

H. Submit shop drawings, a list of proposed material and equipment manufacturers and the names of Subcontractors.

I. Shop drawings shall be provided for all plumbing and mechanical systems for all floors of the building. Plumbing and mechanical shop drawings shall also be provided for the underslab systems (under the foundation slab) and slab-embedded systems such as hydronic radiant loops and controls.

J. Materials and methods with which the words "for approval" or "approved" are used, and materials and methods which differ from those specified, shall be submitted.

K. Prepare and submit shop drawings, sections, details and diagrams to minimum scale 1/4" = 1'-0". Pump rooms and mechanical rooms shall be 1/2" = 1'-0" minimum scale. Drawings shall be coordinated, dimensioned and indicate equipment, pipe, duct, fire protection, and electrical in relation to architectural and structural features. Include

minor piping, drains, air vents, etc. Indicate exact locations and elevations of valves, piping specialties, access doors, dampers, etc. Electronic submittal is encouraged.

L. Submit manufacturer's specifications, data sheets, certified equipment drawings and installation instructions, including installation dimensions, clearances, weights, materials, finishes, color selection, accessories, acoustical characteristics, capacity and full load and part load performance curves; complete with electrical data, motor horse power, KW; motor efficiency, amperage, voltage phases and wiring diagrams. Identify the particular specification section number, paragraph and equipment identification number per equipment schedule.

M. Fan and pumps systems, with equipment in parallel, shall have performance curves noting single equipment operation and all iterations of additional equipment.

N. Certified Equipment Drawings (8-1/2" x 11" sheets) shall be indexed in accordance with Specification Section. Drawings to be submitted at a later date shall be marked with a page as a placeholder for insertion when submitted. The original submittal shall note which shop drawings will be submitted later. Marked-up catalogs are not acceptable and will be returned without action. Electronic submittal is required.

O. County's Representative's review of submittals is for limited purpose of verifying conformance with information given and design concept expressed in Contract Drawings and Specifications. County's Representative's review is not for purpose of determining accuracy or completeness of items such as dimensions and quantities, which remain responsibility of Contractor.

P. Contractor shall not commence with fabrication or installation of any equipment or system until the associated submittals have been approved by the County's Representative and returned with "no exceptions" taken. Contractor shall be solely liable for any costs incurred from starting fabrication before approved submittals are returned.

Q. All final approved submittals and equipment datasheets shall be provided, in PDF format, to the County as part of the as-built drawing set and shall be text searchable.

1.6 COORDINATION DRAWINGS

A. Utilize the latest version of 3D AutoCAD, Navisworks, and/or Revit software for the Coordination Drawings. No proprietary software of any kind shall be used other than that indicated. Drawing paper size shall not be larger than FULL SIZED Contract Drawings, and in no case larger than 30" x 42". Coordinate available space with ALL other trades involved.

B. Provide Coordination Drawings in digital electronic format. Provide both native file format (AutoCAD, Navisworks, or Revit) and PDF format files. Hardcopy drawings are not acceptable.

C. These drawings are to show registers, grilles, diffusers, duct sizes, elevation of bottom of duct, pipe sizes, valves and accessories, elevation of bottom of pipe, all elevations of materials and/or systems throughout each floor inclusive of hanger components, seismic bracing if applicable, and any component of construction that impacts vertical and/or horizontal space. In addition, the locations of all valves, dampers, and other items requiring access for service and maintenance are to be shown. The drawings are to also show electrical, beams, architectural bracing, structural bracing, ceiling heights, access doors, walls, floor to floor dimensions, columns, doors and other major architectural and structural features as shown on the architectural and structural drawings. Where the routing of work differs from that indicated on the Contract Drawings, such areas are to be indicated by highlighting with a note describing the reason for the change.

D. Rerouting of any system or part thereof shall be submitted separately in order to obtain concurrence of the County's Representative. Submitted rerouting must include fully documented proposed solutions with all trades coordinated. Contractor is fully responsible for coordination of systems included herein. Any effort by County's Representative of Record beyond answering Contractor's questions will be at Contractor's expense, including attending coordination meetings, review of interim plans, or review of incomplete questions (routing issues without suggested solutions).

E. The Contractor and subcontractors are responsible to review and resolve any real or apparent interferences or conflicts as indicated by the coordination drawings produced by each trade.

F. After all conflicts or interferences are resolved, develop a final composite drawing showing the agreed upon routing, layout and juxtaposition of all duct work, conveyers, piping, major conduit, valves, panels, lighting fixtures and all other major mechanical, plumbing and electrical installations. In the preparation of all the final Coordination Drawings, large scale details as well as cross and longitudinal sections are required to fully delineate all conditions.

G. Submit the Coordination Drawings as digital electronic files to County's Representative for review and comment, as indicated under "Shop Drawings" above.

H. Contractor shall not commence with fabrication or installation of any equipment or system until the associated shop drawings have been reviewed and returned by the County's Representative. County's Representative's review of shop drawings shall not be taken as approval of their contents. Contractor shall be solely liable for any costs incurred due to deviations from the Contract Drawings.

I. No extra compensation will be paid for relocating any duct, pipe, conduit, or other material that has been installed without proper coordination between all trades involved. If any improperly coordinated work, or installed work that is not in accordance with the approved coordination composites, or is specifically noted by the

County's Representative for a valid reason, necessitates additional work by the other trades, the costs of all such additional work is to be borne solely by the Contractor.

J. All changes in the scope of work due to revisions formally issued and approved are to be shown on both the individual subcontractor's Shop Drawings and the Coordination Drawings.

1.7 REQUESTS FOR INTERPRETATION AND CLARIFICATION

A. See Section 01 31 00 "Project Management", for RFI procedures and forms.

B. Mechanical and plumbing RFIs are in addition subject to the requirements of this Article. In the event of a conflict between the requirements of Section 013100 and this Article, the requirements of this Article shall supersede and take precedence over those of Section 01 31 00.

C. Limit each RFI to a single issue or group of related issues.

D. Each RFI shall include a workable no-cost or lowest cost solution recommendation by Contractor.

E. Allow 3 working days from time of RFI receipt by County's Representative for review and response.

F. Do not send County's Representative more than 10 RFIs in a contiguous period of 5 working days. If excess RFIs are received, review period will be extended as necessary to provide a professional response. RFIs will be reviewed in priority determined by County's Representative in consultation with Contractor.

1.8 MATERIALS AND SUBSTITUTIONS

A. Comply with Section 01 62 00 Product Options and Substitutions.

B. Requests for product or equipment substitution shall be accompanied by a marked-up copy of the County's Representative's original specification. For each specified product feature or requirement, Contractor shall note the equivalent feature or attribute of the proposed substitute product or equipment.

C. Shop drawings of proposed material and equipment that differ from the specified materials and equipment, shall be accompanied by drawings that define changes. These drawings shall show modifications of architectural, plumbing, electrical and mechanical work required by the proposed materials and equipment, such as relocation of flues, drains, revised electrical circuits, relocation of roof or wall penetrations, revised foundations, etc.

1.9 COORDINATION WITH OTHER WORK

A. Contractor performing Work under this Section shall become thoroughly familiar with the Drawings and Specifications. Contractor shall adjust the Work to conform with the conditions shown on these drawings to provide the best possible assembly of the combined Work.

B. Obtain necessary information from the other trades regarding location of their work in order that the Work in this Section may be placed in correct position.

C. The inclusion and proper location of supports, pads, sleepers, openings, anchorages, etc. provided by others is the responsibility of the Contractor under this Section. Cutting and/or boring shall be permitted under this Section only with the written approval of the County's Representative.

D. It shall be the Contractor's responsibility to coordinate and have provided by other trades where not covered by the Contractor's scope of work, all electrical wiring and power to equipment, controls and devices, all plumbing and any other work from other trades as required to provide fully functioning HVAC systems per the Contract Drawings and Specifications.

1.10 MANUFACTURER'S DIRECTIONS

A. Manufacturer's directions shall be followed in cases where the manufacturers of articles used in this contract furnish directions covering points not shown in the Contract Drawings and Specifications.

1.11 PROTECTION OF WORK

A. Equipment and materials shall be stored on dunnage and remain wrapped at all times until installed.

B. Duct and piping shall be remain capped during delivery and storage.

C. During installation, all installed duct and piping shall be capped and protected at the end of each working day.

D. Equipment shall be protected from weather and stored in an enclosed, indoors location. Do not store equipment outside.

E. Until final acceptance of the work, protect materials from damage and provide adequate and proper storage facilities. Replace damaged or defective work, material, and equipment before requesting final acceptance.

1.12 WORKMANSHIP

A. Equipment and materials shall be installed in a neat and workmanlike manner. Materials and equipment not so installed shall, upon order of the County's Representative, be removed and replaced in a satisfactory manner, without change in Contract Sum or additional cost to the County.

1.13 CLOSING IN UNINSPECTED WORK

A. Do not allow or cause any work to be covered up or enclosed until it has been inspected, tested, and accepted by the County's Representative, and/or Commissioning Authority.

B. Any work enclosed or covered-up prior to inspection and testing shall be uncovered. After the work has been tested, inspected and accepted, repair such materials as may be necessary to restore disturbed work to its original and proper condition at no extra cost to the County.

1.14 EQUIPMENT ANCHORING

A. Equipment shall be securely anchored to the building structure to prevent shifting or overturning during earthquakes.

1.15 PRELIMINARY OPERATION

A. Under this section, Contractor shall supervise and direct preliminary operation of systems should the County demand that any portion of the plant, apparatus, or equipment be operated previous to the final completion and acceptance of the work. Expenses for such preliminary operation will be paid by the County. Such preliminary operation or payment shall not be construed as an acceptance of the work.

1.16 CUTTING AND OPENINGS

A. Comply with Section 01 73 29 Cutting and Patching.

1.17 "AS-BUILT" DRAWINGS

A. Comply with Section 01 78 39 Project Closeout.

B. For DDC Building Automation systems, see also COMPLETION REQUIREMENTS in Part 1 of Section 23 09 00 for additional as-built and closeout submittal requirements.

C. As-built drawings shall be furnished in an electronic format. Provide in drafting software (AutoCAD or Revit) native format and also in PDF format.

1.18 FINAL INSPECTION

A. At the time of final inspection, a service representative shall be available to make final adjustments.

1.19 FINAL OPERATION

A. After acceptance of the installation, instruct the County's Representative in operation and maintenance, for a period of three (3), non-consecutive working days at a time requested by the County during the first year of warranty.

B. At the beginning of the instruction period, deliver to the County three (3) copies of a durable binder as described under "Operating Instructions".

1.20 OPERATING INSTRUCTIONS

A. The following O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these Specifications.

B. Division 23 shall compile and prepare documentation for all equipment and systems covered in Division 23 and deliver this documentation to the General Contractor for inclusion in the O&M manuals prior to the training of County personnel.

C. In addition, DDC Contractor shall provide O&M material as required by “Completion Requirements” in Part 1 of Section 23 09 00.

D. Provide a summary of operating sequences (start-up, normal run, and shut-down), and control shop drawings in the main mechanical room.

E. Provide three (3) complete sets of Operating Instructions. These instructions shall include brochures, diagrams, maintenance, and operating instructions and parts lists. See "Final Operation".

F. Provide a copy of the O&M manuals to the Commissioning Authority for review.

1.21 TRAINING OF COUNTY PERSONNEL

A. The General Contractor shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.

B. The Commissioning Authority (CxA) shall be responsible for overseeing and approving the content and adequacy of the training of County personnel for commissioned equipment.

C. Mechanical/Plumbing Contractor. The Contractor shall have the following training responsibilities:
   1. Provide the CxA with a training plan two weeks before the planned training.

2. Provide designated County personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of HVAC equipment including, but not limited to, pumps, air conditioning units, air handling units, fans, boilers, terminal units, controls, water treatment systems, etc.
3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
6. The DDC Contractor shall attend sessions other than the DDC System training, as requested, to discuss the interaction of the DDC System as it relates to the equipment being discussed.
7. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
8. Training shall include:
    a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
    b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
    c. Discussion of relevant health and safety issues and concerns.
    d. Discussion of warranties and guarantees.
    e. Common troubleshooting problems and solutions.
    f. Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.
    g. Discussion of any peculiarities of equipment installation or operation.
    h. Instruction in the use of equipment controls that are integral to equipment or are provided by the equipment manufacturer, such as VRF System controls. This is in addition to and separate from DDC System training and does not replace or satisfy the requirement for such training, if specified. Equipment controls training shall include at least the following:
        1) Specific hardware configuration of installed systems in this building and specific instruction for operating the installed system and any interface with security and communication systems.

2) Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
3) If system supports trending, all trending and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends. Trainees will actually set-up trends in the presence of the trainer.
4) Every screen shall be completely discussed, allowing time for questions.
5) Use of keypad or plug-in laptop computer for mobile control access.
6) Use of remote access to the system via phone lines or networks, if applicable.
7) Graphics generation, if applicable.
8) Point database entry and modifications, if applicable

i. The format and training agenda in The HVAC Commissioning Process, ASHRAE Guideline 1-1989R, 1996 is recommended.
j. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate. A video record of the training session is suggested but not required.

9. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.
10. The Mechanical Contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.
11. Training shall occur after functional testing is complete, unless approved otherwise by the Project Manager.1.21C.8.h

D. DDC Contractor.
1. See TRAINING in Part 3 of Section 230923 for DDC System training requirements and DDC Contractor obligations.
2. DDC Contractor shall coordinate with Mechanical Contractor and Commissioning Authority regarding training on equipment-integrated or manufacturer-supplied control systems as described in Paragraph 1.21C.8.h. Such training is the responsibility of Mechanical Contractor but may be adopted by DDC Contractor by mutual agreement, to facilitate a more integrated training experience.

E. DDC Contractor.
1. Not applicable due to no DDC Building Automation System.
2. Mechanical Contractor is responsible for training on equipment-integrated or manufacturer-supplied control systems as described in Paragraph 1.21C.8.h.

F. Test and Balance (TAB) Contractor. The TAB Contractor shall have the following training responsibilities:
   1. TAB Contractor shall meet with facility staff after completion of TAB and instruct them on the following:
      a. Go over the final TAB report, explaining the layout and meanings of each data type.
      b. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
      c. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
      d. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
      e. Other salient information that may be useful for facility operations, relative to TAB.

1.22 WARRANTY

A. In accordance with Division 01 Project Closeout requirements, Guarantees, Warranties, Bonds, Service & Maintenance Contracts and as follows.

B. Contractor shall leave entire installation in complete working order and free from defects in material, workmanship or finish.

C. Warranty all materials, equipment, apparatus and workmanship to be free of defective materials and faulty workmanship for a minimum period of one (1) year from date of Certificate of Occupancy, or per Division 1, whichever is longer.

D. Warranty also services including instructions, adjusting, testing, noise, balancing, etc.

E. For each piece of equipment or device with a manufacturer’s warranty in excess of one year, Contractor shall furnish certificate of manufacturers' warranty and contact information for manufacturer warranty service. Contractor shall also provide a list or table of all equipment with warranties exceeding one year in duration.

F. Provide new materials, equipment, apparatus, labor and/or service and support to correct or replace that determined by County’s Representative to be defective or faulty.

G. The County reserves the right to make temporary repairs as necessary to keep equipment in operating condition without voiding the guarantees or relieving responsibility during the guarantee period.

H. For DDC System, see WARRANTY and WARRANTY MAINTENANCE in Part 1 of Section 23 09 00. DDC System warranty commences upon the acceptance of COMPLETION REQUIREMENTS described in Part 1 of that Section, which may occur after the Certificate of Occupancy.

I. After a period of 90 calendar days from date of acceptance of systems by County, provide, at no cost to the County, one service mechanic for an 8-hour period over as many working days as required to repair, replace any latent deficiency.

PART 2 - PRODUCTS (NOT USED)

PART 3 - INSTALLATION (NOT USED)

END OF SECTION 23 05 00

SECTION 23 05 13

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 RELATED REQUIREMENTS

A. Section 26 27 17 Equipment Wiring: Electrical characteristics and wiring connections.

B. Section 26 29 13 Enclosed Controllers.

1.3 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; American Bearing Manufacturers Association, Inc.; 1990 (Reapproved 2008).

B. IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators; Institute of Electrical and Electronic Engineers; 2004.

C. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2011.

D. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

A. See Section 01 30 00 Submittal Procedures, for submittal procedures.

B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

C. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than 1/2 horsepower.

D. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.

E. Operation Data: Include instructions for safe operating procedures.

F. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.5 QUALTIY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture of electric motors for Commercial use, and their accessories, with minimum [three] years documented product development, testing, and manufacturing experience.

B. Conform to NFPA 70.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of high efficiency motors.

D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.7 WARRANTY

A. See Section 01 78 36 Warranties, for additional warranty requirements.

B. Provide five year manufacturer warranty for motors larger than 10 horsepower. Provide manufacturer warranty for period of 18 months from date of project substantial completion for motors 10 horsepower or less.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Lincoln Motors: www.lincolnmotors.com.

B. A. O. Smith Electrical Products Company: www.aosmithmotors.com.

C. Reliance Electric/Rockwell Automation: www.reliance.com.

D. Baldor Electric Company

E. Siemens

F. US Motors

G. Toshiba

H. Substitutions: See Section 01 62 00 Product Options and Substitutions.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Electrical Service: Refer to Section 262717 for required electrical characteristics.

B. Electrical Service:
1. Motors less than 5 Horsepower: 208 volts, three phase, 60 Hz or per schedule; all motors called out as VFD equipped to be three phase.
2. Motors 5 Horsepower or larger: 480 volts, three phase, 60 Hz.

C. Construction:
1. Totally enclosed, fan-cooled type except where specifically noted otherwise.
2. Design for continuous operation in 40 degrees C environment.
3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

D. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

E. Wiring Terminations:
1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.4 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.

4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.5 ELECTRICALLY COMMUTATED MOTORS

A. Motor shall be brushless DC type specifically designed for fan applications with heavy duty ball bearings and electronic commutation. It shall contain internal circuitry that converts 115 volt single phase power into a DC signal. The motor shall be speed controllable down to 20% of full speed. Speed control is achieved through a 0-10 volt control signal input through the pre wired controls wires. Motor shall be a minimum of 85% efficient at all speeds.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

D. For motors driven by variable frequency drive, install with Aegis motor shaft grounding ring.

END OF SECTION 23 05 13

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Equipment supports.

1.2 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
1. Trapeze pipe hangers.
2. Metal framing systems.
3. Fiberglass strut systems.
4. Pipe stands.

5. Equipment supports.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.6 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
   3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
   4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
   5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
   3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:
   1. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
   2. Standard: MFMA-4.
   3. Channels: Continuous slotted steel channel with inturned lips.
   4. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.

5. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel

2.4 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig ASTM C 552, Type II cellular glass with 100-psig orASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece plastic base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:
   1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
   2. Base: Plastic.

3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand:
1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
2. Bases: One or more; plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.

2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:
1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:
1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 07 72 00 "Roof Accessories" for curbs.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

N. Insulated Piping:
   1. Attach clamps and spacers to piping.
      a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
      b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
      c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
   2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
   3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
   4. Shield Dimensions for Pipe: Not less than the following:
      a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
      b. NPS 4: 12 inches long and 0.06 inch thick.
      c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
      d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
      e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
   5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
   6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
   2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
   3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
   4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
   5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
   6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
   7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
   8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
   9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
   10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
   11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
   12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
   13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
   14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
   15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
   16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.

17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.

7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.
13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 23 05 26

SECTION 23 05 48

VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Equipment support bases.
   2. Vibration isolators.
   3. Seismic restraints.

1.2 PERFORMANCE REQUIREMENTS

A. Equipment assemblies and equipment anchorages shall be capable of supporting combined gravity and lateral loads, and shall be positively anchored to the structure.

B. Design of equipment assemblies and equipment anchorages shall employ the following seismic design criteria:
   1. Seismic Anchorage: Equipment shall be anchored or otherwise secured to the structure in conformance with section 13.6 of ASCE 7-05 (American Society of Civil Engineers) "Minimum Design Loads of Buildings and Other Structures" and the following parameters:
      a. SDS = per structural engineer
      b. Ip = per structural engineer
      c. ap = per table 13.6.1 of ASCE 7-05
      d. Rp = per table 13.6.1 of ASCE 7-05

1.3 SUBMITTALS

A. See Section 01 33 00 Submittal Procedures, for submittal procedures.

B. Product Data: Provide schedule of vibration isolator type with location and load on each.

C. For equipment that is contractor supplied or is substituted for those that are specified, provide structural calculations for equipment anchorage to the structure, sealed and signed by a civil engineer registered in the State of California, demonstrating conformance with section 13.6 of ASCE 7-05 (American Society of Civil Engineers) "Minimum Design Loads of Buildings and Other Structures".

D. Shop Drawings: Indicate inertia bases and locate vibration isolators, with static and dynamic load on each. Indicate seismic control measures.

E. Shop Drawings: Signed and sealed by a qualified professional structural engineer. Include the following:
   1. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
   2. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.
   3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.
   4. Seismic-Restraint Details: Detail fabrication and attachment of seismic restraints and snubbers. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.
   5. Details for Interlocking Snubbers: Include load deflection curves up to 1/2-inch deflection in x, y, and z planes.

F. Manufacturer's Instructions: Indicate installation instructions with special procedures and setting dimensions.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of vibration isolation device installation and seismic bracing for HVAC piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Perform design and installation in accordance with applicable codes.

B. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and registered and licensed in the State in which the Project is located.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Kinetics Noise Control, Inc: www.kineticsnoise.com.

B. Mason Industries: www.mason-ind.com.

2.2 PERFORMANCE REQUIREMENTS

A. General:
1. All vibration isolators, base frames and inertia bases to conform to all uniform deflection and stability requirements under all operating loads.
2. Steel springs to function without undue stress or overloading.
3. All equipment mounted on vibration isolated bases to have minimum operating clearance of 2 inches between the base and floor or support beneath unless noted otherwise.

2.3 EQUIPMENT SUPPORT BASES

A. Structural Bases:
1. Construction: Engineered, structural steel frames with welded brackets for side mounting of the isolators.
2. Frames: Square, rectangular or T-shaped.
3. Design: Sufficiently rigid to prevent misalignment or undue stress on machine, and to transmit design loads to isolators and snubbers.

2.4 VIBRATION ISOLATORS

A. Non-Seismic Type:
1. All Elastomeric-Fiber Glass Pads:
   a. Configuration: Flat or molded.
   b. Thickness: 0.25 inch minimum.
   c. Assembly: Single or multiple layers using bonded, galvanized sheet metal separation plate between each layer with load plate providing evenly distributed load over pad surface.
2. Elastomeric Mounts:
   a. Material: Oil, ozone, and oxidant resistant compounds.
   b. Assembly: Encapsulated load transfer plate bolted to equipment and base plate with anchor hole bolted to supporting structure.
3. Steel Springs:
   a. Assembly: Freestanding, laterally stable without housing.
   b. Leveling Device: Rigidly connected to equipment or frame.
4. Restrained Steel Springs:
   a. Housing: Rigid blocking during rigging prevents equipment installed and operating height from changing during temporary weight reduction.
   b. Equipment Wind Loading: Adequate means for fastening isolator top to equipment and isolator base plate to supporting structure.
5. Elastomeric Hangers:
   a. Housing: Steel construction containing elastomeric isolation element to prevent rod contact with housing and short-circuiting of isolating function.
   b. Incorporate steel load distribution plate sandwiching elastomeric element to housing.
6. Spring Hanger:

a. Housing: Steel construction containing stable steel spring and integral elastomeric element preventing metal to metal contact.
b. Bottom Opening: Sized to allow plus/minus 15 degrees rod misalignment.

7. Combination Elastomeric-Spring Hanger:
   a. Housing: Steel construction containing stable steel spring with elastomeric element in series isolating upper connection of hanger box to building structure.
   b. Bottom Opening: Sized to allow plus/minus 15 degrees rod misalignment.
8. Thrust Restraints:
   a. Housing: Steel construction containing stable steel spring and integral elastomeric element installed in pairs to resist air pressure thrusts.
   b. Bottom Openings: Sized to allow plus/minus 15 degrees rod misalignment.

B. Seismic Type:
1. Coil Springs Consisting of Single Elements:
   a. Housing: Manufactured from cast iron material.
   b. Ductile Material: Designed and rated for seismic applications.
   c. Spring: Restrained by housing without significant degradation of vibration isolation capabilities during normal equipment operating conditions.
   d. Resilient Snubbing Grommet System: Incorporated and designed with clearances of no more than 0.25 inch in any direction preventing direct metal-to-metal contact between supported member and fixed restraint housing.
   e. Resilient Pad: Located in series with spring.
   f. Coil Springs: Color coded elements to have a lateral stiffness greater than 0.8 times the rated vertical stiffness with 50 percent overload capacity.
   g. Finish: Suitable for the application.

2.5 SEISMIC SNUBBER ASSEMBLIES

A. Comply with:
1. ASHRAE Handbook - HVAC Applications
2. SMACNA - Seismic Duct Restraint Manual

B. All Directional External:
1. Application: Minimum three (3) snubbers are required for each equipment installation, oriented properly to restrain isolated equipment in all directions.
2. Construction: Interlocking steel construction attached to the building structure and equipment in a manner consistent with anticipated design loads.
3. Performance: Equipment movement at each snubber location limited to a maximum of 0.25 inches in any direction without significantly degrading the vibration isolation capability of the isolator during normal operating conditions.
4. Resilient Pad: Minimum 0.25 inch thick cushions any impact and prevents metal-to-metal contact.

C. Lateral External:
   1. Application: Minimum three (3) snubbers are required for each stable equipment installation, oriented properly to restrain isolated equipment in all lateral directions where uplift forces are zero or addressed by other restraints.
   2. Construction: Steel construction attached to the building structure and equipment in a manner consistent with anticipated design loads.
   3. Performance: Equipment movement at each snubber location limited to a maximum of 0.25 inches in any direction without significantly degrading the vibration isolation capability of the isolator during normal operating conditions.
   4. Resilient Pad: Minimum 0.25 inch thick cushions any impact and prevents metal-to-metal contact.

2.6 SEISMIC RESTRAINTS FOR SUSPENDED COMPONENTS AND EQUIPMENT

A. Comply with:
   1. ASHRAE Handbook - HVAC Applications
   2. SMACNA - Seismic Duct Restraint Manual

B. Cable Restraints:
   1. Wire Rope: Steel wire strand cables sized to resist seismic loads in all lateral directions.
   2. Protective Thimbles: Eliminates potential for dynamic cable wear and strand breakage.
   3. Size: Based on the lesser of cable capacity or anchor load taking into account bracket geometry.
   4. Connections:
   5. Use overlapping wire rope U clips, cable clamping bolts, swaged sleeves or seismically rated tool-less wedge insert lock connectors.
   6. Internally brace clevis hanger bracket cross bolt to prevent deformation.
   7. Vertical Suspension Rods: Attach required bracing of sufficient strength to prevent rod buckling from vertical compression forces utilizing series of attachment clips.

C. Rigid Restraints:
   1. Structural Element: Sized to resist seismic loads in all lateral directions and carry both compressive and tensile loading.
   2. Size: Based on the lesser of cable capacity or anchor load taking into account bracket geometry.
   3. Connections: Internally brace clevis hanger bracket cross bolt to prevent deformation.
   4. Static Support System: Anchorage capable of carrying additional tension loads generated by the vertical component of the rigid brace compression which is additive to any static load requirements on the system.
   5. Vertical Suspension Rods: Attached required bracing of sufficient strength to prevent rod buckling from vertical compression forces utilizing series of attachment clips.

PART 3 - EXECUTION

3.1 INSTALLATION – GENERAL

A. Install in accordance with manufacturer's instructions.

3.2 INSTALLATION – SEISMIC

A. Seismic Snubbers:
   1. Provide on all isolated equipment, piping and ductwork.
   2. Provide minimum of four seismic snubbers located close to isolators.
   3. Snub equipment designated for post-disaster use to 0.05 inch maximum clearance.
   4. Snub all other equipment between 0.15 inch and 0.25 inch clearance.

B. Floor and Base-Mounted Equipment, Vibration Isolated Equipment and associated Vibration and Seismic Controls for Connections:
   1. Install equipment anchorage items designed to resist seismic design force in any direction.
   2. Install vibration and seismic controls designed to include base and isolator requirements.
   3. Provide flexible connections between equipment and interconnected piping.
   4. Provide isolators and restraints designed for amplified code forces per ASCE 7 and with demonstrated ability to resist required forces including gravity, operational and seismic forces.

C. Suspended Mechanical Equipment:
   1. Provide supports and bracing to resist seismic design force in any direction.
   2. Provide flexible connections between equipment and interconnected piping.
   3. Brace equipment hung from spring mounts using cable or other bracing that will not transmit vibration to the structure.
   4. Use of proprietary restraint systems with a certificate of compliance, verified and listed by an accredited inspection body is acceptable (pending shop drawing approval), as an alternative to project specific seismic bracing design.

D. Wall mounted Mechanical Equipment:
   1. Provide support and bracing to resist seismic design force in any direction.
   2. Install backing plates or blocking as required to deliver load to primary wall framing members.
   3. Anchoring to gypsum wallboard, plaster or other wall finish that has not been engineered to resist imposed loads is not permitted.

E. Piping:
   1. Provide seismic bracing in accordance ASC 7.
   2. Provide supports, braces, and anchors to resist gravity and seismic design forces.
   3. Provide flexible connections between floor-mounted equipment and suspended piping; between unbraced piping and restrained suspended items; as required for

thermal movement; at building separations and seismic joints; and wherever relative differential movements could damage pipe in an earthquake.

4. Brace resiliently supported pipe with cable bracing or alternate means designed to prevent transmission of vibrations and noise to the structure.
5. Brace every run 5.0 feet or more in length with two transverse and one longitudinal bracing locations.
6. Pipes and Connections Constructed of Ductile Materials (copper, ductile iron, steel or aluminum and brazed, welded or screwed connections):
    a. Provide transverse bracing at spacing not more than 40.0 feet on center.
    b. Provide longitudinal bracing at spacing not more than 80.0 feet on center.
7. Pipes and Connections Constructed of Non Ductile Materials (cast iron, no-hub, plastic or non-UL listed grooved coupling pipe):
    a. Provide transverse bracing at spacing not more than 20.0 feet on center.
    b. Provide longitudinal bracing at spacing not more than 40.0 feet on center.
8. Provide lateral restraint for risers at not more than 30 feet on center or as required for horizontal runs, whichever is less.
9. Piping Explicitly Exempt from Seismic Bracing Requirements:
    a. Provide flexible connections between piping and connected equipment, including in-line devices such as VAV boxes and reheat coils.
    b. Install piping consistent with ASCE 7, such that swinging of the pipes will not cause damaging impact with adjacent components, finishes, or structural framing while maintaining clear horizontal distance of 67 percent of the hanger length between subject components.
    c. Provide swing restraints as required to control potential impact due to limited space between subject components.
10. Use of proprietary restraint systems with a certificate of compliance, verified and listed by an accredited inspection body is acceptable (pending shop drawing approval), as an alternative to project specific seismic bracing design.
11. Re-use of Existing Hangers:
    a. Re-using existing hangers at locations of seismic bracing are to be judged on a case-by-case basis by the registered project design professional.
    b. Unless otherwise shown on the drawings, it is assumed all hangers supporting new piping, located at a seismic brace, will be new.

F. Ductwork:
1. Provide seismic bracing for ducts with cross sectional area greater than 6 sq ft (independent of duct contents).
2. Provide seismic bracing for all ducts containing hazardous materials.
3. Provide supports, braces, and anchors to resist gravity and seismic design forces.
4. Independently support in-line devices weighing more than 20 pounds.
5. Independently support and brace all in-line devices weighing more than 75 pounds.
6. Provide unbraced piping attached to braced in-line equipment with adequate flexibility to accommodate differential displacements.
7. Positively attach dampers, louvers, diffusers and similar appurtenances to ductwork with mechanical fasteners.

8. Install duct supports designed to resist not less than 150 percent of the duct weight.
9. The use of power driven fasteners is prohibited in the hanging of ducts weighing over 10 pounds per lineal foot for seismic design categories D, E, and F.
10. Use of proprietary restraint systems with a certificate of compliance, verified and listed by an IAS AC172 accredited inspection body or otherwise accepted by applicable codes is acceptable (pending shop drawing approval), as an alternative to project specific seismic bracing design.

G. Tanks:
1. Install tank anchorage, tank legs and/or supporting structure designed to resist design force.
2. Provide flexible connections between tank and interconnected piping.

3.3 FIELD QUALITY CONTROL

A. Inspect isolated equipment after installation and submit report. Include static deflections.

B. Inspect isolator seismic-restraint clearance.

C. Test isolator deflection.

D. Inspect minimum snubber clearances.

3.4 ADJUSTING

A. Adjust isolators after piping systems have been filled and equipment is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop.

3.5 VIBRATION ISOLATOR SCHEDULE

A. Spring Isolators
1. Include a resilient pad (e.g. neoprene) under each spring isolator, in addition to any pre-applied pad, to achieve an overall minimum pad thickness of 3/4 inch.

B. Anchor Bolts
1. At anchor bolts, provide neoprene washer bushings (Mason HG or equal).

C. HVAC Piping
   1. Within 10 feet of noise sensitive spaces with an NC rating of 35 or quieter, the piping should be isolated as listed below. Piping should be vibration isolated from the structure, other piping, ductwork, gypsum board, and similar building elements. This applies to all pipes attached to framing adjacent to occupied spaces and to pipes suspended from the structure above or below occupied spaces.
   2. 3" and larger:
      a. Isolator Type: Spring hangers, equal to Mason BR, ND, or HD hangers).
      b. Minimum Static Deflection: 0.20."
      c. Installation: First ten points of support from vibration isolated equipment.
   3. 1" to 3":
      a. Isolator Type: Trisolator Series 100/500 felt lined sleeves.
      b. Minimum Static Deflection: 0.20."
      c. Installation: Minimum 25' from inlet and discharge.
      d. Approved Alternate:
         1) Isolator Type: Hangers, equal to Mason HD.
         2) Minimum Static Deflection: 0.20."
         3) Installation: Minimum 25’ from the inlet and discharge from vibration isolated equipment.
   4. 1" and smaller:
      a. Isolator Type: Acousto-Plumb or Hubbard Hold-Rite Silencer system.
      b. Minimum Static Deflection: 0.20."
   5. Provide minimum 1 inch clearance between piping and gyp board or suspended ceilings.

		ISOLATOR		SEISMIC RESTRAINT	
Equipment	Description	Static Deflection	Mason Isolator (or equal)	Description	Mason Type (or equal)
Air Handling Units (internally isolated)	Unhoused Spring Mount	2.0”	MSL	Internally supplied by manufacturer.	
Roof/Floor Mounted Fans	Unhoused Spring Mount	1.0”	MSL	All-direction snubber	Z-1225
Suspended Fans	Spring Hanger	1.0”	HS	Slack cable	
Supported Fan Coil Units	Unhoused Spring Mount	1.0”	MSL	Seismic restraint is built into the vibration isolator.	
Suspended Fan Coil Units	Spring Hanger	1.0”	HS	Slack cable	
Chillers	Unhoused Spring Mount	2.0”	MSL	Seismic restraint is built into the vibration isolator.	

Pumps (Base Mounted)	Unhoused Spring Mount	1.0”	MSL	Seismic restraint is built into the vibration isolator.
Condensing Units	Neoprene	0.2”	BR	Seismic restraint is built into the vibration isolator.
Boilers	Neoprene	0.2”	BR	Seismic restraint is built into the vibration isolator.
Expansion Tanks	Neoprene	0.2”	BR	Seismic restraint is built into the vibration isolator.

END OF SECTION 23 05 48

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.
5. Stencils.
6. Valve tags.
7. Warning tags.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

C. Valve numbering scheme.

D. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:
1. Material and Thickness: Brass, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
4. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:
   1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
   2. Letter Color: White.
   3. Background Color: Black
   4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
   5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
   6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
   7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black

C. Background Color: Orange.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
   1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
   2. Lettering Size: Size letters according to ASME A13.1 for piping

2.4 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

C. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

D. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

E. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

F. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings; also include duct size and an arrow indicating flow direction.
   1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.

2.5 STENCILS

A. Stencils for Piping:
   1. Lettering Size: Size letters according to ASME A13.1 for piping
   2. Stencil Paint: Exterior, gloss, acrylic enamel in colors complying with recommendations in ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.

2.6 VALVE TAGS

A. Description: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
   1. Tag Material: anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
   2. Fasteners: Brass S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
   1. Valve-tag schedule shall be included in operation and maintenance data.

2.7 WARNING TAGS

A. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.
   1. Size: 4 by 7 inches
   2. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
   3. Color: Safety-yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.
   1. Identification Paint: Use for contrasting background.
   2. Stencil Paint: Use for pipe marking.

B. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
   1. Near each valve and control device.
   2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
   3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
   4. At access doors, manholes, and similar access points that permit view of concealed piping.
   5. Near major equipment items and other points of origination and termination.
   6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
   7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

3.5 DUCT LABEL INSTALLATION

A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:
   1. Blue: For supply ducts.
   2. Yellow: For exhaust and relief ducts.
   3. Green: For outside-, return-, and mixed-air ducts.

B. Stenciled Duct Label Option: Stenciled labels showing service and flow direction may be provided instead of plastic-laminated duct labels, at Installer's option.

C. Locate labels near points where ducts enter into and exit from concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.6 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
   1. Valve-Tag Colors:
      a. Toxic and Corrosive Fluids: Black letters on a safety-orange background.
      b. Flammable Fluids: Black letters on a safety-yellow background.
      c. Combustible Fluids: White letters on a safety-brown background.
      d. Potable and Other Water: White letters on a safety-green background.
      e. Compressed Air: White letters on a safety-blue background.
      f. Defined by User: White letters on a safety-purple background, black letters on a safety-white background, white letters on a safety-gray background, and white letters on a safety-black background

3.7 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 23 05 53

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Balancing Air Systems:
      a. Variable-air-volume systems.
   2. Testing, Adjusting, and Balancing Equipment:
      a. Motors.
      b. Condensing units.
   3. Testing, adjusting, and balancing existing systems and equipment.
   4. Sound tests.
   5. Vibration tests.
   6. Duct leakage tests.
   7. Control system verification.

1.2 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. BAS: Building automation systems.

C. NEBB: National Environmental Balancing Bureau.

D. TAB: Testing, adjusting, and balancing.

E. TABB: Testing, Adjusting, and Balancing Bureau.

F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

G. TDH: Total dynamic head.

1.3 PREINSTALLATION MEETINGS

A. TAB Conference: If requested by the County, conduct a TAB conference at the Project Site after approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Provide a minimum of 14 days' advance notice of scheduled meeting time and location.
   1. Minimum Agenda Items:
      a. The Contract Documents examination report.
      b. The TAB plan.
      c. Needs for coordination and cooperation of trades and subcontractors.
      d. Proposed procedures for documentation and communication flow.

1.4 ACTION SUBMITTALS

A. LEED Submittals:
   1. Air-Balance Report for Prerequisite IEQ 1: Documentation indicating that work complies with ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
   2. TAB Report for Prerequisite EA 2: Documentation indicating that work complies with ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 60 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 60 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

D. System Readiness Checklists: Within 60 days of Contractor's Notice to Proceed, submit system readiness checklists as specified in "Preparation" Article.

E. Examination Report: Submit a summary report of the examination review required in "Examination" Article.

F. Certified TAB reports.

G. Sample report forms.

H. Instrument calibration reports, to include the following:
   1. Instrument type and make.
   2. Serial number.
   3. Application.
   4. Dates of use.
   5. Dates of calibration.

1.6 QUALITY ASSURANCE

A. TAB Specialists Qualifications: Certified by AABC, NEBB or TABB.
   1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC, NEBB or TABB.
   2. TAB Technician: Employee of the TAB specialist and certified by AABC, NEBB or TABB as a TAB technician.

B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.7 FIELD CONDITIONS

A. Full County Occupancy: County will occupy the site and existing building during entire TAB period. Cooperate with County during TAB operations to minimize conflicts with County's operations.

B. Partial County Occupancy: County may occupy completed areas of building before Substantial Completion. Cooperate with County during TAB operations to minimize conflicts with County's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.

L. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.

M. Examine system pumps to ensure absence of entrained air in the suction piping.

N. Examine operating safety interlocks and controls on HVAC equipment.

O. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes the following:
1. Equipment and systems to be tested.
2. Strategies and step-by-step procedures for balancing the systems.
3. Instrumentation to be used.
4. Sample forms with specific identification for all equipment.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
   1. Airside:
      a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
      b. Duct systems are complete with terminals installed.
      c. Volume, smoke, and fire dampers are open and functional.
      d. Clean filters are installed.
      e. Fans are operating, free of vibration, and rotating in correct direction.
      f. Variable-frequency controllers' startup is complete and safeties are verified.
      g. Automatic temperature-control systems are operational.
      h. Ceilings are installed.
      i. Windows and doors are installed.
      j. Suitable access to balancing devices and equipment is provided.
   2. Refrigerant Piping:
      a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
      b. Piping is complete with terminals installed.
      c. Systems are flushed, filled, and air purged.
      d. Control valves are functioning per the sequence of operation.
      e. Shutoff and balance valves have been verified to be 100 percent open.
      f. Pumps are started and proper rotation is verified.
      g. Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
      h. Variable-frequency controllers' startup is complete and safeties are verified.
      i. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance," ASHRAE 111 NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
   1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
   2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 23 33 00 "Air Duct Accessories."
   3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 23 07 13 "Duct Insulation," Section 23 07 16 "HVAC Equipment Insulation," and Section 23 07 19 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Section 23 31 13 "Metal Ducts."

3.5 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Adjust the variable-air-volume systems as follows:
   1. Verify that the system static pressure sensor is located two-thirds of the distance down the duct from the fan discharge.
   2. Verify that the system is under static pressure control.
   3. Select the terminal unit that is most critical to the supply-fan airflow. Measure inlet static pressure, and adjust system static pressure control set point so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.

4. Calibrate and balance each terminal unit for maximum and minimum design airflow as follows:
    a. Adjust controls so that terminal is calling for maximum airflow. Some controllers require starting with minimum airflow. Verify calibration procedure for specific project.
    b. Measure airflow and adjust calibration factor as required for design maximum airflow. Record calibration factor.
    c. When maximum airflow is correct, balance the air outlets downstream from terminal units.
    d. Adjust controls so that terminal is calling for minimum airflow.
    e. Measure airflow and adjust calibration factor as required for design minimum airflow. Record calibration factor. If no minimum calibration is available, note any deviation from design airflow.
    f. When in full cooling or full heating, ensure that there is no mixing of hot-deck and cold-deck airstreams unless so designed.
    g. On constant volume terminals, in critical areas where room pressure is to be maintained, verify that the airflow remains constant over the full range of full cooling to full heating. Note any deviation from design airflow or room pressure.
5. After terminals have been calibrated and balanced, test and adjust system for total airflow. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.
    a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
    b. Set terminals for maximum airflow. If system design includes diversity, adjust terminals for maximum and minimum airflow so that connected total matches fan selection and simulates actual load in the building.
    c. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
    d. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
    e. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
6. Measure fan static pressures as follows:
    a. Measure static pressure directly at the fan outlet or through the flexible connection.
    b. Measure static pressure directly at the fan inlet or through the flexible connection.
    c. Measure static pressure across each component that makes up the air-handling system.
    d. Report any artificial loading of filters at the time static pressures are measured.
7. Set final return and outside airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
    a. Balance the return-air ducts and inlets the same as described for constant-volume air systems.

b. Verify that terminal units are meeting design airflow under system maximum flow.

8. Re-measure the inlet static pressure at the most critical terminal unit and adjust the system static pressure set point to the most energy-efficient set point to maintain the optimum system static pressure. Record set point and give to controls contractor.
9. Verify final system conditions as follows:
   a. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to match design if necessary.
   b. Re-measure and confirm that total airflow is within design.
   c. Re-measure final fan operating data, rpms, volts, amps, and static profile.
   d. Mark final settings.
   e. Test system in economizer mode. Verify proper operation and adjust if necessary. Measure and record all operating data.
   f. Verify tracking between supply and return fans.

3.6 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports for pumps, coils, and heat exchangers. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:
   1. Check liquid level in expansion tank.
   2. Check highest vent for adequate pressure.
   3. Check flow-control valves for proper position.
   4. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
   5. Verify that motor starters are equipped with properly sized thermal protection.
   6. Check that air has been purged from the system.

3.7 PROCEDURES FOR MOTORS

A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:
   1. Manufacturer's name, model number, and serial number.
   2. Motor horsepower rating.
   3. Motor rpm.
   4. Phase and hertz.
   5. Nameplate and measured voltage, each phase.
   6. Nameplate and measured amperage, each phase.
   7. Starter size and thermal-protection-element rating.
   8. Service factor and frame size.

B. Motors Driven by Variable-Frequency Controllers: Test manual bypass of controller to prove proper operation.

3.8 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record fan and motor operating data.

3.9 SOUND TESTS

A. After the systems are balanced and construction is Substantially Complete, measure and record sound levels at locations as designated by the Architect.

B. Instrumentation:
   1. The sound-testing meter shall be a portable, general-purpose testing meter consisting of a microphone, processing unit, and readout.
   2. The sound-testing meter shall be capable of showing fluctuations at minimum and maximum levels, and measuring the equivalent continuous sound pressure level (LEQ).
   3. The sound-testing meter must be capable of using 1/3 octave band filters to measure mid-frequencies from 31.5 Hz to 8000 Hz.
   4. The accuracy of the sound-testing meter shall be plus or minus one decibel.

C. Test Procedures:
   1. Perform test at quietest background noise period. Note cause of unpreventable sound that affects test outcome.
   2. Equipment should be operating at design values.
   3. Calibrate the sound-testing meter prior to taking measurements.
   4. Use a microphone suitable for the type of noise levels measured that is compatible with meter. Provide a windshield for outside or in-duct measurements.
   5. Record a set of background measurements in dBA and sound pressure levels in the eight un-weighted octave bands 63 Hz to 8000 Hz (NC) with the equipment off.
   6. Take sound readings in dBA and sound pressure levels in the eight un-weighted octave bands 63 Hz to 8000 Hz (NC) with the equipment operating.
   7. Take readings no closer than 36 inches from a wall or from the operating equipment and approximately 60 inches from the floor, with the meter held or mounted on a tripod.
   8. For outdoor measurements, move sound-testing meter slowly and scan area that has the most exposure to noise source being tested. Use A-weighted scale for this type of reading.

D. Reporting:
   1. Report shall record the following:
      a. Location.
      b. System tested.
      c. dBA reading.
      d. Sound pressure level in each octave band with equipment on and off.
   2. Plot sound pressure levels on NC worksheet with equipment on and off.

3.10 VIBRATION TESTS

A. After systems are balanced and construction is Substantially Complete, measure and record vibration levels on equipment having motor horsepower equal to or greater than 10.

B. Instrumentation:
   1. Use portable, battery-operated, and microprocessor-controlled vibration meter with or without a built-in printer.
   2. The meter shall automatically identify engineering units, filter bandwidth, amplitude, and frequency scale values.
   3. The meter shall be able to measure machine vibration displacement in mils of deflection, velocity in inches per second, and acceleration in inches per second squared.
   4. Verify calibration date is current for vibration meter before taking readings.

C. Test Procedures:
   1. To ensure accurate readings, verify that accelerometer has a clean, flat surface and is mounted properly.
   2. With the unit running, set up vibration meter in a safe, secure location. Connect transducer to meter with proper cables. Hold magnetic tip of transducer on top of the bearing, and measure unit in mils of deflection. Record measurement, then move transducer to the side of the bearing and record in mils of deflection. Record an axial reading in mils of deflection by holding nonmagnetic, pointed transducer tip on end of shaft.
   3. Change vibration meter to velocity (inches per second) measurements. Repeat and record above measurements.
   4. Record CPM or rpm.
   5. Read each bearing on motor, fan, and pump as required. Track and record vibration levels from rotating component through casing to base.

D. Reporting:
   1. Report shall record location and the system tested.
   2. Include horizontal-vertical-axial measurements for tests.
   3. Verify that vibration limits follow Specifications, or, if not specified, follow the General Machinery Vibration Severity Chart or Vibration Acceleration General Severity Chart from the AABC National Standards. Acceptable levels of vibration are normally "smooth" to "good."

4. Include in report General Machinery Vibration Severity Chart, with conditions plotted.

3.11 DUCT LEAKAGE TESTS

A. Witness the duct pressure testing performed by Installer.

B. Verify that proper test methods are used and that leakage rates are within specified tolerances.

C. Report deficiencies observed.

3.12 CONTROLS VERIFICATION

A. In conjunction with system balancing, perform the following:
   1. Verify temperature control system is operating within the design limitations.
   2. Confirm that the sequences of operation are in compliance with Contract Documents.
   3. Verify that controllers are calibrated and function as intended.
   4. Verify that controller set points are as indicated.
   5. Verify the operation of lockout or interlock systems.
   6. Verify the operation of valve and damper actuators.
   7. Verify that controlled devices are properly installed and connected to correct controller.
   8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
   9. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.

B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.13 TOLERANCES

A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
   1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
   2. Air Outlets and Inlets: Plus or minus 10 percent.
   3. Refrigerant Flow Rate: Plus or minus 10 percent.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.14 PROGRESS REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for

systems balancing devices. Recommend changes and additions to systems balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare monthly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.15 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
   1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
   2. Include a list of instruments used for procedures, along with proof of calibration.
   3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:
   1. Pump curves.
   2. Fan curves.
   3. Manufacturers' test data.
   4. Field test reports prepared by system and equipment installers.
   5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:
   1. Title page.
   2. Name and address of the TAB specialist.
   3. Project name.
   4. Project location.
   5. Architect's name and address.
   6. Engineer's name and address.
   7. Contractor's name and address.
   8. Report date.
   9. Signature of TAB supervisor who certifies the report.
   10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
   11. Summary of contents including the following:
      a. Indicated versus final performance.
      b. Notable characteristics of systems.
      c. Description of system operation sequence if it varies from the Contract Documents.
   12. Nomenclature sheets for each item of equipment.
   13. Data for terminal units, including manufacturer's name, type, size, and fittings.

14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:
    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data:
    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.
    h. Sheave make, size in inches, and bore.
    i. Center-to-center dimensions of sheave and amount of adjustments in inches.
    j. Number, make, and size of belts.
    k. Number, type, and size of filters.
2. Motor Data:
    a. Motor make, and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.
    e. Sheave make, size in inches, and bore.
    f. Center-to-center dimensions of sheave and amount of adjustments in inches.
3. Test Data (Indicated and Actual Values):
    a. Total airflow rate in cfm.

b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Preheat-coil static-pressure differential in inches wg.
g. Cooling-coil static-pressure differential in inches wg.
h. Heating-coil static-pressure differential in inches wg.
i. Outdoor airflow in cfm.
j. Return airflow in cfm.
k. Outdoor-air damper position.
l. Return-air damper position.
m. Vortex damper position.

F. Apparatus-Coil Test Reports:
1. Coil Data:
a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch o.c.
f. Make and model number.
g. Face area in sq. ft..
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.
2. Test Data (Indicated and Actual Values):
a. Airflow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
e. Return-air, wet- and dry-bulb temperatures in deg F.
f. Entering-air, wet- and dry-bulb temperatures in deg F.
g. Leaving-air, wet- and dry-bulb temperatures in deg F.
h. Refrigerant expansion valve and refrigerant types.
i. Refrigerant suction pressure in psig.
j. Refrigerant suction temperature in deg F.

G. Fan Test Reports: For supply, return, and exhaust fans, include the following:
1. Fan Data:
a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.

h. Center-to-center dimensions of sheave and amount of adjustments in inches.

2. Motor Data:
   a. Motor make, and frame type and size.
   b. Horsepower and rpm.
   c. Volts, phase, and hertz.
   d. Full-load amperage and service factor.
   e. Sheave make, size in inches, and bore.
   f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
   g. Number, make, and size of belts.
3. Test Data (Indicated and Actual Values):
   a. Total airflow rate in cfm.
   b. Total system static pressure in inches wg.
   c. Fan rpm.
   d. Discharge static pressure in inches wg.
   e. Suction static pressure in inches wg.

H. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
1. Report Data:
   a. System and air-handling-unit number.
   b. Location and zone.
   c. Traverse air temperature in deg F.
   d. Duct static pressure in inches wg.
   e. Duct size in inches.
   f. Duct area in sq. ft..
   g. Indicated airflow rate in cfm.
   h. Indicated velocity in fpm.
   i. Actual airflow rate in cfm.
   j. Actual average velocity in fpm.
   k. Barometric pressure in psig.

I. Air-Terminal-Device Reports:
1. Unit Data:
   a. System and air-handling unit identification.
   b. Location and zone.
   c. Apparatus used for test.
   d. Area served.
   e. Make.
   f. Number from system diagram.
   g. Type and model number.
   h. Size.
   i. Effective area in sq. ft..
2. Test Data (Indicated and Actual Values):
   a. Airflow rate in cfm.
   b. Air velocity in fpm.
   c. Preliminary airflow rate as needed in cfm.

d. Preliminary velocity as needed in fpm.
e. Final airflow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

J. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:
   1. Unit Data:
      a. Unit identification.
      b. Location.
      c. Service.
      d. Make and size.
      e. Model number and serial number.
      f. Water flow rate in gpm.
      g. Water pressure differential in feet of head or psig.
      h. Required net positive suction head in feet of head or psig.
      i. Pump rpm.
      j. Impeller diameter in inches.
      k. Motor make and frame size.
      l. Motor horsepower and rpm.
      m. Voltage at each connection.
      n. Amperage for each phase.
      o. Full-load amperage and service factor.
      p. Seal type.
   2. Test Data (Indicated and Actual Values):
      a. Static head in feet of head or psig.
      b. Pump shutoff pressure in feet of head or psig.
      c. Actual impeller size in inches.
      d. Full-open flow rate in gpm.
      e. Full-open pressure in feet of head or psig.
      f. Final discharge pressure in feet of head or psig.
      g. Final suction pressure in feet of head or psig.
      h. Final total pressure in feet of head or psig.
      i. Final water flow rate in gpm.
      j. Voltage at each connection.
      k. Amperage for each phase.

K. Instrument Calibration Reports:
   1. Report Data:
      a. Instrument type and make.
      b. Serial number.
      c. Application.
      d. Dates of use.
      e. Dates of calibration.

3.16 VERIFICATION OF TAB REPORT

A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of commissioning authority.

B. Commissioning agent shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

E. If TAB work fails, proceed as follows:
   1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
   2. If the second final inspection also fails, County may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
   3. If the second verification also fails, Architect may contact AABC Headquarters regarding the AABC National Performance Guaranty.

F. Prepare test and inspection reports.

3.17 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 23 05 93

SECTION 23 07 13

DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following duct services:
   1. Indoor, concealed supply and outdoor air.
   2. Indoor, exposed supply and outdoor air.
   3. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
   4. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
   5. Outdoor, exposed supply and return.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

B. LEED Submittals:
   1. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
   2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
   3. Detail application of field-applied jackets.
   4. Detail application at linkages of control devices.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290,. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

H. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied ASJ Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

I. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJcomplying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

J. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.

2.2 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Board: Structural-grade, press-molded, xonolite calcium silicate, fireproofing board suitable for operating temperatures up to 1700 deg F. Comply with

ASTM C 656, Type II, Grade 6. Tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

B. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
   1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
   1. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
   1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. PVC Jacket Adhesive: Compatible with PVC jacket.
   1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
   1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
   2. Service Temperature Range: Minus 20 to plus 180 deg F.

3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
4. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.
1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
2. Service Temperature Range: 0 to 180 deg F.
3. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
4. Color: White.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.
1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
2. Service Temperature Range: Minus 50 to plus 220 deg F.
3. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
4. Color: White.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: 60 percent by volume and 66 percent by weight.
4. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
3. Service Temperature Range: 0 to plus 180 deg F.
4. Color: White.

2.6 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile

Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:
   1. Materials shall be compatible with insulation materials, jackets, and substrates.
   2. Fire- and water-resistant, flexible, elastomeric sealant.
   3. Service Temperature Range: Minus 40 to plus 250 deg F.
   4. Color: White.
   5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
   1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
   2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
   3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
   4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
   5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.8 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric: Approximately 6 oz./sq. yd. with a thread count of 5 strands by 5 strands/sq. in. for covering ducts.

B. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for ducts.

2.9 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd..

2.10 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
   1. Adhesive: As recommended by jacket material manufacturer.
   2. Color: White

D. Metal Jacket:
   1. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
      a. Finish and thickness are indicated in field-applied jacket schedules.
      b. Moisture Barrier for Indoor Applications: 1-mil-thick, heat-bonded polyethylene and kraft paper
      c. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper

E. Self-Adhesive Outdoor Jacket: 60-mil-thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with white aluminum-foil facing.

2.11 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
   1. Width: 3 inches.
   2. Thickness: 11.5 mils.
   3. Adhesion: 90 ounces force/inch in width.
   4. Elongation: 2 percent.
   5. Tensile Strength: 40 lbf/inch in width.
   6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.12 SECUREMENTS

A. Bands:
   1. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, with wing seal.

B. Insulation Pins and Hangers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
3. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
    a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
4. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
    1. Verify that systems to be insulated have been tested and are free of defects.
    2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:
   1. Draw jacket tight and smooth.
   2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
   3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
      a. For below ambient services, apply vapor-barrier mastic over staples.
   4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
   5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
   4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
   4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

E. Insulation Installation at Floor Penetrations:
   1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
   2. Seal penetrations through fire-rated assemblies.

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
   1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
   2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
   3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
      a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
      b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
      c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
      d. Do not overcompress insulation during installation.
      e. Impale insulation over pins and attach speed washers.
      f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
   4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
      a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
      b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
   5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
   6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
   7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
   1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
   2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
   3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
      a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
      b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
      c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
      d. Do not overcompress insulation during installation.
      e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
   4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
      a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
      b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
   5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
   6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
   1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
   2. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
   3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:
   1. Draw jacket material smooth and tight.
   2. Install lap or joint strips with same material as jacket.
   3. Secure jacket to insulation with manufacturer's recommended adhesive.
   4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
   5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.
   1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.8 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 07 84 13 "Penetration Firestopping."

3.9 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Div 09.
   1. Flat Acrylic Finish: Two> finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
      a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum jackets.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:
   1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each duct system defined in the "Duct Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:
   1. Indoor, concealed supply and outdoor air.
   2. Indoor, exposed supply and outdoor air.
   3. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
   4. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
   5. Outdoor, concealed supply and return.
   6. Outdoor, exposed supply and return.

B. Items Not Insulated:
   1. Factory-insulated flexible ducts.
   2. Factory-insulated plenums and casings.
   3. Flexible connectors.
   4. Vibration-control devices.
   5. Factory-insulated access panels and doors.

3.12 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, rectangular, round and flat-oval, supply-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 1-1/2 inches. Minimum R-4.2.

B. Concealed, rectangular, round and flat-oval, return-air duct insulation shall be one of the following:
   1. Mineral-Fiber Blanket: 1-1/2 inches Minimum R-4.2. nominal density.
   2. Mineral-Fiber Board: 2 inches. Minimum R-8.0.

C. Exposed, supply and return-air duct insulation shall be the following:
   1. Mineral-Fiber Board: 2 inches with PVC jacket. Minimum R-4.2

3.13 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. All outdoor, exposed ducts and fittings shall have a panel thickness of minimum 31 mm, R-8.1.

END OF SECTION 23 07 13

SECTION 23 08 00

COMMISSIONING OF HVAC

PART 1 - GENERAL

1.1 DESCRIPTION

A. The purpose of this section is to specify Division 23 responsibilities in the commissioning process which are being directed by the Commissioning Authority (CA). The commissioning requirements designated in this section pertain to building commissioning activities and documentation in support of Calgreen 2013 Commissioning Requirements.

B. The systems to be commissioned are listed in Section 01 91 13. Contractors MUST refer to section 01 91 13 for this and other Commissioning information. Mechanical Systems Commissioning section does not replace, but instead complements, the contents of the 01 91 13 and all parties shall be held to the information contained in both sections.

C. Commissioning (Cx) requires the participation of Division 23 to ensure that all systems are operating in a manner consistent with the Contract Documents through documented functional testing and startup procedures. The general commissioning requirements and coordination are detailed in Division 1. Division 23 shall be familiar with all parts of Division 1 and the Commissioning Plan issued by the Commissioning Authority (CA) and shall execute all Cx responsibilities assigned to them in the Contract Documents.

1.2 RELATED SECTIONS

A. Section 23 09 93 - Direct Digital Control System for HVAC.

B. Section 01 91 13- General Commissioning Requirements.

1.3 RESPONSIBILITIES

A. Mechanical, Controls and Test and Balance (TAB) Contractors. The Cx responsibilities applicable to each of the mechanical, controls and TAB contractors of Division 23 are as follows (all references apply to commissioned equipment only):
   1. Include and itemize the cost of Cx, including functional testing, documentation, and all specified requirements in the contract price.
   2. In each purchase order or subcontract written, include requirements for submittal data, Cx documentation, O&M data and operator training.
   3. Attend a Cx scoping meeting and other meetings necessary to facilitate the Cx process.
   4. Contractors shall provide the CA with normal cut sheets and shop drawing submittals of commissioned equipment.

5. Provide additional requested documentation, prior to normal O&M manual submittals, to the CA for development of functional testing procedures.
   a. This shall include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any Owner-contracted tests, fan and pump curves, preliminary balance reports, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CA.
   b. The CA may request further documentation necessary for the commissioning process, and requests may be made prior to normal submittals.
6. Provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review and approval.
7. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
8. Provide assistance to the CA in preparing the specific functional performance test procedures. Contractors shall review test procedures to ensure feasibility, safety, acceptability under warranty requirements, equipment protection and provide necessary written alarm limits to be used during the tests.
9. During the startup and initial checkout process, execute the pre-functional checklists (provided by CA) for all commissioned equipment and return to the CA.
10. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA for inclusion in the Commissioning Report. This may be done parallel with the pre-functional tests.
11. Address current Architect/Engineer (A/E) punch list items before the commencement of functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.
12. Provide skilled technicians to execute starting of equipment and to rehearse and execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and all resultant problem-solving.
13. Provide skilled technicians to perform functional performance testing under the direction of the CA for specified equipment. Contractor shall rehearse the functional tests and correct system (or identified and informed the CA of test procedure) discrepancies from design prior to the verification tests. Assist the CA in interpreting the monitoring data, as necessary.
14. Provide written responses, in a timely manner, to all items noted in the Cx submittal reviews and Cx issues log that relate to Division 23
15. Correct any deficiencies (differences between specified and observed performance) as interpreted by the CA, CMGC and A/E and retest the equipment.

Note contractor may be responsible for the cost of retesting if there are excessive test failures; see Section 01 9 113, Part 3.5

16. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
17. During construction, maintain as-built red-line drawings for all drawings and final CAD as-built for contractor-generated coordination drawings. Provide to CA as requested for functional test development and update after completion of commissioning (excluding deferred testing and seasonal testing).
18. Provide training of the Owner's operating staff using expert qualified personnel, as specified in Section 01 91 13.
19. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
20. Warranty Period
    a. Assist CA in execution of select seasonal or deferred functional performance testing.
    b. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

B. Mechanical Contractor. The responsibilities of the HVAC mechanical contractor, during construction and acceptance phases in addition to those listed are:
   1. Provide startup for all HVAC equipment.
   2. Assist and cooperate with the TAB contractor and CA by:
      a. Review Draft Functional Performance Tests and issue comments to CA.
      b. Successfully rehearse Functional Performance Tests and provide a signed copy prior to CA visit to witness test execution.
      c. Putting all HVAC equipment and systems into operation and continuing the operation during each working day of TAB and Cx, as required.
      d. Including cost of sheaves and belts that may be required by TAB.
      e. Providing test holes in ducts and plenums where directed by TAB to allow air measurements and air balancing. Provide approved plugs to seal holes.
      f. Providing temperature and pressure taps according to the Construction Documents for TAB and Cx testing. Note sample port (P/T or Pete's plug) requirements in hydronic details.
      g. Install a P/T plug at each water sensor which is an input point to the control system.
      h. List and clearly identify on the as-built drawings the locations of all air-flow stations.
      i. Prepare a preliminary schedule for Division 15 pipe and duct system testing, flushing and cleaning, equipment start-up and TAB start and completion for use by the CA. Update the schedule as appropriate.
      j. Notify the CxC or CA depending on protocol, when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and TAB will occur. Be responsible to notify the CMGC Commissioning Coordinator or CA, ahead of time, when commissioning activities not yet performed or not yet scheduled will delay construction. Be proactive in seeing that

commissioning processes are executed and that the CA has the scheduling information needed to efficiently execute the commissioning process.

k. Verify all air is bled from system and verify bleed by checking for air at 10% of manual vents no more than 3 days prior to functional testing.

C. Controls Contractor. The commissioning responsibilities of the controls contractor, during construction and acceptance phases in addition to those listed are:

1. As-Built Sequence of Operation Submittals. The Controls Contractor's submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, including time of day schedules, schedule frequency, and detailed point listings with ranges and initial setpoints.
2. Control Drawings Submittal
   a. The control drawings shall have a key to all abbreviations.
   b. The control drawings shall contain graphic schematic depictions of the systems and each component.
   c. The schematics will include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
   d. Provide a full points list
3. An updated as-built version of the control drawings and sequences of operation shall be included in the final controls as-built drawings submittal.
4. Assist and cooperate with the TAB contractor in the following manner:
   a. Meet with the TAB contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB contractor any needed unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.).
   b. For a given area, have all required prefunctional checklists, calibrations, startup and selected functional tests of the system completed and approved by the CA prior to TAB.
   c. Provide a qualified technician to operate the controls to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.
   d. Coordinate with the TAB contractor to acquire all balance related setpoint, for example the minimum duct pressure required at design flow and/or the pump system pressure differential required at design flow condition.
5. Assist and cooperate with the CA in the following manner:
   a. Review Draft Functional Performance Tests and issue comments to CA.
   b. Successfully rehearse Functional Performance Tests and provide a signed copy prior to CA visit to witness test execution.
   c. Using a skilled technician who is familiar with this building, execute the functional testing of the controls system. Assist the CA in interpreting the monitoring data, as necessary.
   d. Execute all control system trend logs specified in Functional Tests. Trend data will be required in electronic format, specifically in a Microsoft Excel compatible format (ASCII text, comma delineated,.xls, etc.).

e. Ensure that all of the trended points are sampled at 1 minute intervals, all points may be trended simultaneously and the data is stored for all points at minimum for a 1 year period.
f. Provide the Commissioning Authority remote internet access to the Building Automation System during the Commissioning Period.

6. Provide a signed and dated certification to the CA and CMGC Commissioning Coordinator upon completion of the checkout of each controlled device, equipment and system prior to functional testing for each piece of equipment or system, that all system programming is complete as to all respects of the Contract Documents, except functional testing requirements.
7. List and clearly identify on the as-built duct and piping drawings the locations of all static and differential pressure sensors (air, water and building pressure).

D. TAB Contractor. The duties of the TAB contractor, in addition to those listed are:
1. A running log of events and issues shall be kept by the TAB field technicians. Submit hand-written reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests to the CA and CxC at least once a week.
2. Communicate in writing to the controls contractor all setpoint and parameter changes made or problems and discrepancies identified during TAB which affect the control system setup and operation.
3. Provide a draft TAB report within two weeks of completion. A copy will be provided to the CA. The report will contain a full explanation of the methodology, assumptions and the results in a clear format with designations of all uncommon abbreviations and column headings. The report should follow the latest and most rigorous reporting recommendations by AABC, NEBB or ASHRAE Standard 111.
4. Demonstrate repeatability of 10% of final air and water measurements, upon request by CA.
5. Provide the CA with any requested data, gathered, but not shown on the draft reports.
6. Provide a final TAB report for the CA with details, as in the draft.
7. Assist in resolving any balancing issues discovered during functional testing.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Division 23 shall provide all test equipment necessary to fulfill the testing requirements of this Division. Refer to 01 91 13.

PART 3 - EXECUTION

3.1 COMMISSIONING PROCESS AND PROCEDURES

A. Refer to 01 9 113 – General Commissioning Requirements for a summary of the Commissioning process and procedures.

3.2 PRE-FUNCTIONAL CHECKLISTS

A. The HVAC mechanical and controls contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this specification. Division 23 contractors have start-up responsibility and are required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures do not relieve or lessen this responsibility or shift that responsibility partially to the CA or Owner.

B. Review and Complete Pre-functional Checklists in accordance with Section 01 91 13.

C. CMGC Commissioning Coordinator (CxC) shall verify completion of all items, sign and return the checklist to the Commissioning Authority as an indication of final completion with all installation criteria as specified in the Project Contract Documents

D. A separate completed checklist shall be submitted for each system and item of equipment within the commissioning scope of work, as specified in 01 91 13.

E. The Pre-Functional Readiness Checklists do not represent all the contract documents for the associated equipment. Completion of the items on this checklist does not release the contractor from requirements specified elsewhere.

3.3 TAB REVIEW

A. Testing, Adjusting and Balancing (TAB): TAB shall be provided by the Contractor in accordance with the project specifications. The TAB contractor shall support commissioning by submitting the preliminary TAB data for CA review and participating on the Commissioning TAB Field Review, in which the TAB Contractor demonstrates specified results to the CA after completion of final TAB.

B. Equipment tested: All HVAC systems & associated equipment.

C. Demonstrate:
   1. Determination of the final set points for pump speed and fan speed control per the project specifications. Demonstrate for all set points
   2. Airflow rates are balanced and adjusted per the project specifications
      a. Demonstrate minimum outside airflow rates for all air handling equipment
      b. Demonstrate a 10% sample for all other measurements
   3. Hydronic system flow rates are balanced and adjusted per the project specifications.
      a. Demonstrate for all boilers, chillers, cooling towers, and distribution pumps
      b. Demonstrate a 10% sample for all other measurements.

4. Verify TAB of circulating domestic hot water system per the project specifications. Demonstrate a 10% sample.

3.4 FUNCTIONAL PERFORMANCE TESTING

A. The Functional Performance Test (FPT) Procedures shall be developed, performed, and demonstrated in accordance with Section 01 91 13.

B. Contractor is responsible for conducting test runs of all required Functional Performance Tests, and submit results to the CxA prior to the Commissioning Authority witnessed Functional Testing. See Section 01 91 13 – Part 3.2 for additional details.

C. The initial FPTs shall be provided after review of the final and approved controls submittal. The final FPTs may be modifications of the initial FPTs, and FPTs may be added; modifications and additions to be made by the Commissioning Authority after equipment submittals have been accepted.

D. The Contractor's Commissioning Coordinator shall coordinate the subcontractors, with the Commissioning Authority's input, in developing, performing, and demonstrating the Working FPT.

E. Functional testing shall consist of the following four phases:
   1. Component testing:
      a. Component testing applies to all control input and output devices, including those provided by the equipment suppliers and those provided with the Building Automation System (BAS). Examples include but are not limited to: sensor assemblies, detectors, relays and switches, valves, dampers, and actuators
      b. Component testing applies to thermometers, gauges:
      c. Component testing consists of demonstrating field I/O calibration and operation including but not limited to:
         1) Accuracy of sensors is within design temperature range as specified.
         2) Alarmed points report correctly to operator work station.
         3) Accuracy and settings of binary switches and alarms is as specified, within design temperature range
         4) Actuators operate smoothly in a linear relationship with the signal they receive over the full range of operation
         5) Fail safe operation of components and controllers is as specified for loss of control signal, electric power, and network communications
         6) All components, values and alarms are correctly mapped to operator interface station
         7) Air pressure reference points appropriately located and protected from transient effects of diffusers, wind, and other localized conditions.
   2. Systems Testing; Operational Verification: After functional testing of the system components has been successfully completed, each sequence of operation and control system function shall be functionally tested, including those provided by

the equipment suppliers and those provided with the Building Automation System (BAS). Each control loop shall be tested to verify stable control with the specified and appropriate responses. Testing may include examination of trended data for any point, even where not explicitly called out in functional test script.

3. Systems Testing - Integrated System Verification: After operational testing has successfully demonstrated that each system functions in accordance with the project documents, functional testing shall occur to verify that the interaction between the systems is as required. Each interactive function shall be functionally tested, including those provided by the equipment suppliers and those provided with the BAS.
4. Systems Testing - Real Time Performance Analysis (trend logging):
    a. After operational testing has been successfully completed real time performance testing may be performed to further corroborate correct operation and/or verify the operation of systems that eluded the initial test phase. Data shall be logged for the intervals and periods specified in the FPT procedures. Unless otherwise specified in the FPTs, test periods shall include occupied, unoccupied, weekday and weekend schedules.
    b. All points shall be trended, initiated at the end of construction, continuing over the entire commissioning period and left in place for future use or seasonal commissioning. All points shall be simultaneously trended per the interval specified by the CA. Historical archiving shall be enabled so that data is continuous with no gaps and accessible in the future. The data shall be capable of being stored at a minimum of 1 year period.
    c. Internet or web-based remote access shall be provided to the commissioning agent for the commissioning period. Trends shall be displayed graphically and shall be user configurable at the graphical interface. Graphical displays shall be capable of containing multiple points on a single graph.
    d. Analysis of the data shall demonstrate that that the systems operate in accordance with the acceptance criteria specified in the FPT procedures. Verify that data demonstrates acceptable results before submitting for CA review. If acceptable results are not demonstrated, perform testing and trouble shooting and corrective action to provide resolution. Provisions for retesting, as specified in 01 91 13 shall apply to trend log analysis.
    e. In addition to the initial test period, data logged during a peak heating period, a peak cooling period, and a transitional season period if so specified.

3.5 ISSUE CORRECTION

A. See Section 01 91 13 – Part 3.5 for issue resolution procedures.

3.6 OPERATION AND MAINTENANCE (O&M) MANUALS

A. See Section 01 91 13 – Part 3.7 (F).

3.7 TRAINING OF OWNER PERSONNEL

A. See Section 01 91 13 – Part 3.8.

END OF SECTION 23 08 00

SECTION 23 09 00

INSTRUMENTATION AND CONTROL PERFORMANCE SPECIFICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:
1. Communications
2. Operator Interface
3. Controller Software
4. Web Based Access
5. BAS Graphics
6. Building Controllers
7. Application Specific Controllers
8. Advanced Application Controllers
9. Application Specific Controller - Terminal Unit Controllers
10. Input/output Interface
11. Power Supplies and Line Filtering
12. Control Panels
13. Auxiliary Control Devices
14. Wiring and Raceways
15. Smoke Detection for Projects with a Building Fire Alarm System

B. This is a performance specification and Contractor is responsible for design tasks and engineering.

1.2 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.3 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
1. Current edition of ANSI/ASHRAE Standard 135 and addendum, BACnet.
2. Current edition of UL 916 Underwriters Laboratories Standard for Energy Management Equipment, Canada and the US.
3. Current edition of FCC Part 15, Subpart J, Class A.
4. Current edition of BACnet Testing Laboratories (BTL).

1.4 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Prepare and submit a detailed schedule of work. Schedule to identify milestones such as equipment submittals, control panel diagrams, color graphic panel displays, Interlock.
   2. Wiring diagrams, control program sequence software flow chart diagrams, conduit layout diagrams, device location diagrams, equipment and component deliveries, installation sequencing, controller startup, point to point startup, control programming, sequence testing, commissioning/acceptance testing and training.
   3. Submit design drawings, sequences of operation, program listings, software flow charts and details for each typical piece of equipment and system being controlled. No work to be initiated or fabrication of any equipment started prior to the Owner's Representatives return of REVIEWED submittals.
      a. Sequence of Operation: Please note that the sequence of operation included in the design documents is intended only to communicate the Engineers' general control intent and is not to be used as a direct reference for programming of the EMS system. Verbatim duplication of the Engineer's Sequence of Operation on the submittals is discouraged and may result in non-approval of the submittal. Sequence of operation on submittals to accurately detail the system's intended programming, and include details of all enhancements, adjustments, or deviations from the Engineer's sequence of operation. Submitted sequence of operation to be written with a logical and organized format and flow. Provide detailed, clear and unambiguous sequence of operation language. Point descriptors and point nomenclature referenced in the submitted sequence of operation to match those (to be) actually programmed. As-built submittal Sequence of Operation to include all modifications to the programming made as a result of any addendum, bulletins, RFI's, change orders, and commissioning.
   4. Format: Make each submittal in one complete and contiguous package. Partial or unmarked submittals will be rejected without review.
   5. Submit Manufacturers Data as Follows:
      a. Complete materials list of items proposed to be furnished and installed. A complete Bill of Materials, listing materials, components, devices, wire and equipment are required for this work. The Bill of Materials to be separate for each controller on its own page(s) and to contain the following information for each item listed:
         1) Manufacturer's Name and Model number with furnished options highlighted.
         2) Quantity of each by controller location.
         3) Description of product (generic).

4) Specified item.
5) Operating range or span.
6) Operating point or set point.

b. Manufacturer's specifications and other data required demonstrating compliance with the specified requirements, including but not limited to: Catalog cuts, technical data and descriptive literature on hardware, software, and system components to be furnished.
c. The data to be clearly marked and noted to identify specific ranges, model numbers, sizes, and other pertinent data. Submit printed manufacturer's technical product data for each control device furnished, indicating dimensions, capacities, performance characteristics, electrical characteristics, finishes of materials and including printed installation instructions and start-up instructions.
d. Unless specifically called for otherwise, provide bound copies of catalog cuts for standard products, not requiring specifically prepared Shop Drawings, for the following:
   1) Wire and Cable, Class II
   2) Face Plates for Devices
   3) Disconnect Switches for Power Control
e. Where more than one item, size, rating or other variations appear on a catalog cut sheet, clearly identify items to be provided. These items to be properly indexed and referenced to identification numbers, designations and/or details on the Drawings.

6. Shop Drawings: Submit shop drawings for each controlled system, depicting the following information:
   a. Schematic flow diagram of system showing fans, pumps, coils, dampers, valves and other control/monitoring devices.
   b. Label each control device with initial setting or adjustable range of control. Label points in schematic diagrams with termination at corresponding controller.
   c. Electrical Wiring: Clearly differentiate between portions of wiring that are factory installed and portions of be field-installed.
   d. Details of control panel faces, including controls, instruments, and labeling.
   e. Interfaces to equipment furnished under other Sections identifying numbers of wires, termination location, voltages and pertinent details. Responsibility for each end of the interfaces to be noted on these drawings whether or not they are a part of this Section.
7. Equipment locations, wiring and piping schematics, details, panel configurations, sizes, damper motor mounting details, valve schedules, and a points list keyed to specific hardware submittals. Control wiring depicted as fully annotated ladder diagrams with terminations identified, completely configured as to the exact panel, wiring, relay, switch, and component configuration.
8. Tag Number Lists: Develop instruments tag number system and submit list for approval. Coordinate methods and number block with the Owner Representative.

9. Format the Shop and Field Drawings to Include:
   a. A Title Sheet containing a drawing list, abbreviations list, symbols list, site and vicinity maps for project location and schedules.
   b. Floor Plans showing proposed device locations and device nomenclatures.
   c. A Riser Diagram illustrating conduit relationships between devices shown on the Floor Plans. Show device nomenclatures.
   d. A Single-Line Diagram for each system showing signal relationships of devices within the system. Show device nomenclatures.
   e. A Wiring Diagram for each assembly, enclosure or free standing device, showing:
      1) The Devices Within
      2) Wiring Connections
      3) Wire Identification
      4) Voltage Levels
      5) Fuse Ratings
   f. Operations and Maintenance Manuals:
      1) Following approval of Shop Drawings of control equipment and prior to acceptance of control work, prepare Operating and Maintenance manuals describing operating, servicing, and maintenance requirements of control systems and equipment installed under this Section, in accordance the General and Special Conditions of these Specifications.
      2) Information contained in the manual for the above equipment to include the following:
         a) Manufacturer's catalog cuts and printed descriptive bulletins.
         b) Manufacturer's installation, operating, and maintenance instruction booklets. Complete instructions regarding the operation and maintenance of equipment involved.
         c) Instrument calibration certificates.
         d) Parts list and costs.
         e) Complete nomenclature of replaceable parts, list of recommended spare parts for 12 months operation, their part numbers, current cost and name and address of the nearest vendor of replacement parts.
         f) Name, address and telephone number for closest source of spare parts.
         g) Wiring and schematic diagrams.
         h) Include final record copies of shop drawings.
         i) Copy of guarantees and warranties issued for the various items of equipment, showing dates of expiration.
         j) Reduced plans, diagrams, and control schematics.
         k) Copies of test results.
         l) Control System Operating Manual including: point of summary and point data base; complete printout of program listings; magnetic tape CD or DVD backup of Field Control Cabinet programs; cabinet layout; hard copy of graphic screens; hard copy of specified reports.

g. A final Bill of Quantities including a separate schedule for portable equipment, if delivered as part of this work.
h. Performance, Test and Adjustment Data: Comprehensive documentation of performance verification according to parameters specified in these specifications.
i. Record Drawings: Comply with Division 01, General Requirements and Section 23 00 00, HVAC Basic Requirements. Provide complete as-built submittals including "as-programmed" sequence of operation as well as final occupancy schedules.

1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
1. Installer Qualifications: Company specializing in performing work of the type specified in this Section with minimum five year's experience in the local area. Installers required to have successfully completed manufacturer's control system factory training.

1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.7 SYSTEM DESCRIPTION

A. Control system referenced throughout specifications and drawings as Building Automation System (BAS), Building Management System (BMS), or Energy Management System (EMS) interchangeably consists of high-speed, peer-to-peer network of DDC controllers, control system server, and operator workstation.

B. System software based on server/thin-client architecture, designed around open standards of web technology. Control system server accessed using a web browser over control system network, Owner's local area network, and remotely over Internet (through Owner's LAN).

C. Intent of thin-client architecture is to provide operators complete access to control system via web browser. No special software other than web browser required to access graphics, point displays, and trends.

D. Local Area Network (LAN) either 10 or 100 Mpbs Ethernet network.

E. System will consist of open architecture that is capable of:
1. High speed Ethernet communication using TCP/IP protocol

2. Native BACnet communications according to ANSI / ASHRAE Standard 135, latest edition.
    a. Provide necessary BACnet-compliant hardware and software to meet the system's functional specifications. Controller devices must be BTL tested and listed by an official BACnet Testing Laboratory and have the BTL mark issued.
3. OPC server communications according to OPC Data Access 2.0 and Alarms and Events 1.0.

F. Complete temperature control system to be DDC with electronic sensors and electronic/electric actuation valves and dampers.

G. Prepare individual hardware layouts, interconnection drawings, building riser/architecture diagram and sequence of control from the project design data. Any architecture diagrams on design drawings have been included as schematics only and are not meant to portray quantity of devices or power/data requirements.

H. Design, provide, and install equipment cabinets, panels, data communication network infrastructure (including cables, conduits, outlets, connections, etc.) needed, and associated hardware.

I. Provide complete manufacturer's specifications for items that are supplied. Include vendor name and model number of every item supplied.

J. Provide a comprehensive operator and technician training program as described in these specifications.

K. Provide as-built documentation, operator's terminal software, diagrams, and other associated project operational documentation (such as technical manuals) on approved media, the sum total of which accurately represents the final system.

L. Provide 120V power, low voltage power, transformers, etc. for control panels, transformer panels, and BAS devices. Install per Division 26, Electrical specifications. Power for devices within this specification Section are solely the responsibility of the BAS Contractor.

M. Conduit and raceway systems. Install per Division 26, Electrical specifications.

N. All devices, components, controllers, and software to be manufacturer's most current version at the time of installation.

1.8 SYSTEM PERFORMANCE

A. Performance Standards - System conforms to following minimum standards over network connections:
    1. Graphic Display: Graphic with 20 dynamic points display with current data within 10 seconds.

2. Graphic Refresh: Graphic with 20 dynamic points update with current data within 8 seconds.
3. Object Command: Devices react to command of binary object within 2 seconds. Devices begin reacting to command of analog object within 2 seconds.
4. Object Scan: Data used or displayed at controller or workstation have been current within previous 6 seconds.
5. Alarm Response Time: Object that goes into alarm be annunciated at workstation within 45 seconds.
6. Program Execution Frequency: Custom and standard applications be capable of running as often as once every 5 seconds. Select execution times consistent with mechanical process under control.
7. Performance: Programmable controllers be able to completely execute DDC PID control loops at frequency adjustable down to once per second. Select execution times consistent with mechanical process under control.
8. Multiple Alarm Annunciation: Each workstation on network receive alarms within 5 seconds of other workstations.

B. Reporting Accuracy: System reports values with minimum end-to-end accuracy listed in Reporting Accuracy Table below.
   1. Reporting Accuracy Table:

Measure Variable	**Reported Accuracy**
Space Temperature	Plus or Minus 1 degree F
Ducted Air	Plus or Minus 1 degrees F
Outside Air	Plus or Minus 2 degrees F
Dew Point	Plus or Minus 3 degrees F
Water Temperature	Plus or Minus 1 degree F
Delta-T	Plus or Minus 0.25 degree F
Relative Humidity	Plus or Minus 5 percent RH
Water Flow	Plus or Minus 2 percent of full scale

   2. Note 1: Accuracy applies to 10 percent-100 percent of scale
   3. Note 2: For both absolute and differential pressure
   4. Note 3: Not including utility-supplied meters

C. Control Stability and Accuracy. Control loops maintain measured variable at set point within tolerances listed in Control Stability and Accuracy Table below.
   1. Control Stability and Accuracy Table:

Controlled Variable	**Control Accuracy**	**Range of Medium**
Air Pressure	Plus or minus 0.2 inch wg	0-6 inch wg
	Plus or minus 0.01 inch wg	-0.1 to 0.1 inch wg
Airflow	Plus or minus 10 percent of full scale	
Space Temperature	Plus or minus 2.00 degrees F	

Duct Temperature	Plus or minus 3.0 degrees F	
Humidity	Plus or minus 5 percent RH	
Fluid Pressure	Plus or minus 1.5 PSI	1-150 PSI
	Plus or minus 1.0 inch wg	0-50 inch wg differential

PART 2 - PRODUCTS

2.1 NORTHERN CALIFORNIA MANUFACTURERS/INSTALLERS

A. Delta Controls/Delta Controls Inc.

B. Duct/Spot-Type Smoke Detectors (Project with Fire Alarm System):
   1. See Division 28 for Products.

2.2 COMMUNICATIONS

A. Each controller to have communication port for connection to operator interface.
   1. Internetwork operator interface and value passing to be transparent to internetwork architecture.
   2. Operator interface connected to controller to allow operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, reports, system software, and custom programs to be viewable and editable from each internetwork controller.

B. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers to be readable by each controller on internetwork.

C. Operator Workstation to be capable of simultaneous direct connection and communication with BACnet/IP, OPC and TCP/IP networks without use of interposing devices such as PC or gateway with hard drive.

D. Workstations, Building Control Panels and Controllers with real-time clocks use time synchronization service. System automatically synchronizes system clocks daily from operator-designated device via internetwork. System automatically adjusts for daylight savings and standard time as applicable.

E. All instrumentation and control devices shall be native BACnet. No gateways or field servers will be permitted.

F. No unapproved network switches will be allowed. All Ethernet devices shall not include additional switches for maintenance or programming.

2.3 OPERATOR INTERFACE

A. Operator Interface: PC-based workstations reside on high-speed network with building controllers. Each workstation or each standard browser connected to server be able to access system information.

B. Hardware: Each operator workstation or web server consists of the following:
   1. Computer: Hardware meets or exceeds DDC system manufacturer's recommended specifications and meet response times specified elsewhere in this document. Following hardware requirements also apply:
      a. Hard disk have sufficient memory to store:
         1) Required operator workstation software.
         2) One year of trend data based on points specified to be trended at specified trend intervals.
      b. Minimum hardware configuration includes:
         1) Intel i7 Processor
         2) 8 GB of RAM
         3) 48x CD-RW/DVD Optical Drive
         4) 1 TB Hard Disk Drive Providing Data at 3 GB/sec
         5) Ethernet 10/100 Network Interface Card
         6) High Performance Graphics Card
         7) 22-in LCD Monitor with at least 1024 x 768 Resolution
         8) Keyboard and Mouse
         9) Color Inkjet Printer
         10) UPS (uninterruptible power supply) installed at server, sized with sufficient capacity to allow full operation for 10 minutes or more.
   2. Modem: Auto-dial modem and associated cables transmit over voice-grade telephone lines at nominal 56Kb between workstation or web server and remote buildings and workstations.
   3. Portable Operator's Terminal: Portable Operator's Terminal capable of accessing system data. This device may be connected to any point on system network or to any controller for programming, setup, and troubleshooting. Portable Operator's Terminal be IBM-compatible notebook-style PC including software and hardware required. PC contains at minimum:
      a. 1.73 GHz or better Pentium Processor
      b. 4 GB of RAM
      c. 500 GB Hard Drive
      d. Touch-Pad or Other Internal Pointing Device
      e. High-Performance Graphics Adapter
      f. Ethernet 10/100 Network Interface Card
      g. Integrated Wireless 802.11 b/g
      h. Serial Port and CD/RW-ROM
      i. Internal Modem, 56Kb Minimum

C. System Software:
   1. Operating System: Furnish concurrent multi-tasking operating system. Operating system also supports use of and includes other common software applications such as Microsoft Excel, Word, Microsoft Access and Adobe Acrobat. Acceptable operating systems are Windows XP and Windows 7.
   2. Dynamic Color Graphics:
      a. Real-time color graphic displays dynamic and able to update displays.
      b. Provide operator ability to change values (set points) and states in system controlled equipment directly from graphic display.
      c. Custom Graphics. Provide custom graphics generation package.
      d. Graphics Library. Furnish library of standard HVAC equipment graphics and include standard symbols for fans, pumps, coils, valves, piping, dampers, and ductwork.
   3. All software to be manufacturer's most current version at the time of installation.

D. System Applications: Each workstation provides operator interface and off-line storage of system information. Provide following applications at each workstation:
   1. Automatic System Database Save and Restore: Each workstation stores on hard disk copy of current database of each Building Controller. This database automatically updated whenever change is made in any system panel.
   2. Manual Database Save and Restore: System operator able to manually save or clear database and initiate download of specified database from/to any panel.
   3. System Configuration: Workstation software provides method of configuring system to allow for changes or additions by users and performs following tasks:
      a. Create, delete or modify control strategies.
      b. Add/delete objects to system.
      c. Tune control loops through adjustment of control loop parameters.
      d. Enable or disable control strategies.
      e. Generate hard copy records of control strategies on printer.
      f. Select points to be alarmed and define alarm state.
      g. Select points to be trended and initiate automatic recording of values.
      h. Start/Stop binary objects and adjust analog objects.
   4. Security: Operator required to log on to system with user name and password in order to view, edit, add, or delete data. System security selectable for each operator.
   5. System Diagnostics: System automatically monitor operation of workstations, printers, modems, network connections, building management panels, and controllers. Failure of any device to be annunciated.
   6. Alarm Indication and Handling:
      a. Workstation provides visual means of alarm indication. Alarm indication becomes highest priority regardless of application(s) running.
      b. System provides and archive log of alarm messages to hard drive. Alarm messages to include description of event-initiating object, source, location and time/date of alarm.

7. Trend Logs: Operator able to define custom trend log for any data object and include interval, start time, and stop time. Trend data sampled and stored on building controller panel, be archived on hard disk, and be retrievable for use in spreadsheets and standard database programs.
    a. System server to periodically gather historically recorded data stored in the building controllers and archive the information. Archived files to be appended with new sample data, allowing samples to be accumulated.
    b. Software to be included that is capable of graphing the trend logged object data. Software capable of creating two-axis (x,y) graphs that display object values relative to time.
    c. Operator able to change trend log setup information. This includes the information to be logged as well as the interval at which it is to be logged. Input, output, and value object types in the system may be logged. Provide operations password protected. Setup and viewing may be accessed directly from any and all graphics on which object is displayed.
    d. BAS Contractor to enable trending for any and all system points (physical or virtual) as directed by the Engineer, Owner or Commissioning Authority (Commissioning Authority). There will be no limit on the number of trended points the BAS Contractor is to set up. BAS Contractor will modify trend setup parameters as directed by the Commissioning Authority during testing. BAS Contractor to be proactive and enable trending for all major system points during system startup/programming. BAS Contractor is not to wait for direction to begin trending points. Trend data for each point to be archived on the main server for a minimum of one year. Trend data archiving to be enabled immediately upon trend setup, or as soon as communication between the field panel and sever is established. Trend data uploads from field panel to server set up to be automatically performed with sufficient frequency to ensure no data gaps or loss of trend data.
    e. Trend points as identified in the points list. Provide system specific trend data in two-axis (x,y) graphs that display object values relative to time to Engineer, Owner, or Commissioning Authority.
8. Standard Reports: Standard system reports provided for this project. Provide ability for Owner to readily customize these reports for this project:
    a. Objects: System (or subsystem) objects and their current values.
    b. Logs:
        1) Alarm History
        2) System Messages
        3) System Events
        4) Trends

E. Interfaces to Third Party Systems: BAS connects to third party systems (VFDs, chillers, emergency generators, rooftop AC units, etc.). Communication protocol specified for third party system, and BAS provides compatible protocol to assure proper two way communication. Points, alarms, and commands displayed on BAS as indicated.

F. Workstation Applications Editors: Each PC workstation supports editing of system applications, which downloaded and executed at one or more controller panels.

2.4 CONTROLLER SOFTWARE

A. Furnish following applications software for building and energy management. Software applications reside and operate in system controllers. All software to be manufacturer's most current version at the time of installation. All software and associated functions (scheduling, optimum start/stop, etc.) noted in this specification are to be configured and enabled for this project. Incorporate into sequence of operation submittals for review prior to installation.

B. System Security:
   1. User access secured using individual security passwords and user names.
   2. Restrict user passwords to objects, applications, and system functions as assigned by system manager. Provide monitoring only access to Engineer of Record and Commissioning Authority for period of one year for trouble shooting purposes.
   3. Record user Log On/Log Off attempts.
   4. Provide passwords, user names, and access assignments adjustable at the operator's terminal. Each user to have a set security level, which defines access to displays and individual objects the user may control. System to include 10 separate and distinct security levels for assignment to users.
   5. System to include an Auto Logout Feature that will automatically logout user when there has been no keyboard or mouse activity for a set period of time. Time period to be adjustable by system administrator. Auto Logout may be enabled and disabled by system administrator. Operator terminal to display message on screen that user is logged out after Auto Logout occurs.

C. Scheduling: Provide capability to schedule each object or group of objects in system. Coordinate schedule with Owner and program accordingly. Each schedule consists of:
   1. Operator's workstation to show information in easy-to-read daily format. Priority for scheduling: Events, holidays and daily with events being the highest.
   2. Holiday and special event schedules to display data in calendar format. Operator able to schedule holidays and special events directly from these calendars.
   3. Operator able to change information for a given weekly or exception schedule if logged on with the appropriate security access.

D. Optimum Start/Stop: Provide software and program system to start equipment on sliding schedule based upon indoor and outdoor conditions. Determine minimum time of HVAC system operation needed to satisfy space environmental requirements and also determine earliest possible time to stop mechanical systems (i.e. hut down cooling/heating and only provide ventilation one hour prior to scheduled unoccupied period.) Optimum start/stop program operates in conjunction with scheduled start/stop and night setback programs.

E. Alarms:
   1. Operator's workstation to provide visual means of alarm indication. The alarm dialog box to always become the top dialog box regardless of the application(s), currently running.
   2. System to provide log of alarm messages. Alarm log to be archived to the hard disk of the system operator's terminal. Each entry to include a description of the event-initiating object generating the alarm. Entry to include time and date of alarm occurrence.
   3. Alarm messages in user-definable text and entered either at the operator's terminal or via remote communication.
   4. Each binary object set to alarm based on operator-specified state.
   5. Each analog object have both high and low alarm limits.
   6. Alarms must be able to be automatically and manually disabled.
   7. Alarms be routed to appropriate workstations based on time and other conditions. An alarm able to start programs, print, be logged in event log, generate custom messages, and display graphics.
   8. System have ability to dial out in event of alarm.

F. Demand Limiting:
   1. System to include demand limiting program that includes two types of load shedding. One type of load shedding to shed/restore equipment in binary fashion based on energy usage when compared to shed and restore settings. The other type of shedding to adjust operator selected control set points in an analog fashion based on energy usage when compared to shed and restore settings. Shedding may be implemented independently on each and every zone or piece of equipment connected to system.
   2. Status of each and every load shed program capable of being displayed on every operator terminal connected to system. Status of each load assigned to an individual shed program displayed along with the description of each load.
   3. Demand-limiting program monitor building power consumption from signals generated by pulse generator (provided by BAS contractor) mounted at building power meter or from watt transducer or current transformer attached to building feeder lines.
   4. Demand-limiting program predicts probable power demand so that when demand exceeds demand limit, action will be taken to reduce loads in predetermined manner. When demand limit will not be exceeded, action will be taken to restore loads in predetermined manner.

G. Maintenance Management: System monitors equipment status and generate maintenance messages based upon user-designated run-time, starts, and/or calendar date limits. Coordinate settings with Owner.

H. Sequencing: Provide application software based upon sequences of operation specified to properly sequence designated systems. Provide all points to achieve specified sequences.

I. Staggered Start: This application prevents controlled equipment from simultaneously restarting after a power outage. Order in which equipment (or groups of equipment) is started, along with time delay between starts to be user-selectable.

J. Energy Calculations: Provide software to allow instantaneous power (9e.g. kW) or flow rates (e.g. L/s (gpm)) to be accumulated and converted to energy usage data.

K. Anti-Short Cycling: Binary output objects protected from short cycling by allowing minimum on-time and off-time to be selected.

L. On/Off Control with Differential: Provide algorithm that allows binary output to be cycled based on controlled variable and set point. Algorithm direct-acting or reverse-acting and incorporate adjustable differential.

M. Run-Time Totalization: Provide software to totalize run-times for binary input objects.

2.5 WEB BASED ACCESS

A. General Description: BAS supplier to provide web-based access to the system as part of standard installation. Provide access to user of displays of real-time data that are part of the BAS via a standard Web browser. Web browser to tie into the network via Ethernet network connection. Provide web-page host that resides on the BAS network. Web-page software not to require a per user licensing fee or annual fees. The web-page host must be able to support at least 50 simultaneous users with the ability to expand the system to accommodate an unlimited number of users. Software to be manufacturer's most current version at time of installation.

B. Browser Technology: Browser to be standard version of Microsoft Internet Explorer, Chrome, or Firefox (latest edition). No special vendor-supplied software needed on computers running browser. Displays viewable and the Web-page host to directly access real-time data from the BAS network. Data displayed in real time and update automatically without user interaction. User able to change data on displays if logged in with the appropriate user name and password.

C. Display of Data: Web page graphics shown on browser to be replicas of the BAS displays. User to need no additional training to understand information presented on Web pages when compared to what is shown on BAS displays. Web page displays to include animation just as BAS displays. Fans to turn, pilot lights to blink, and coils to change colors, and so on. Real-time data shown on browser Web pages. This data must be directly gathered via the BACnet network and automatically updated on browser Web page displays without any user action. Data on the browser to automatically refresh as changes are detected without re-drawing the complete display. User to be able to change data from browser Web page to if the user is logged on with the appropriate password. Clicking on a button or typing in a new value to change digital data. Using pull-down menus or typing in a new value to change analog data. Data displays navigated using pushbuttons on the displays that are simply clicked on

with the mouse to select a new display. Alternatively, the standard back and forward buttons of the browser can be used for display navigation.

D. Web Page Generation: Web pages generated automatically from the BAS displays that reside on the BAS server. User to access Web-page host via the network and initiate a web page generation utility that automatically takes the BAS displays and turns them into Web pages. The Web pages generated are automatically installed on the Web page host for access via any computer's standard browser. Any system that requires use of an HTML editor for generation of Web pages will not be considered.

E. Password Security and Activity Log: Access via Web browser to utilize the same hierarchical security scheme as BAS system. User asked to log in once the browser makes connection to Web-page host. Once the user logs in, any and all changes that are made to be tracked by the BAS system. User able to change only those items that the user has authority to change. A user activity report to show any and all activity of the users that have logged in to the system regardless of whether those changes were made using a browser or via the BAS workstation.

F. Communication: Web-page host to communicate using the specified protocol standard to devices on the BAS network.

2.6 GRAPHICS

A. Develop customized graphics showing the project building(s) and their floor plans, mechanical, and electrical equipment, flow and control diagrams, and other relevant features on Workstation graphic screens. Associated input, output, and virtual objects (e.g., temperature and pressure set points) listed in the Sequence of Operation, and shown on the Input/Output Objects List included in the graphic screens and bound to the database. Real-time value of objects updated on the display of each graphic automatically. For projects where existing campus and/or building controls systems exist, replicate graphics used in the existing BAS graphics screens.

B. Graphics to have links to the Print function and to display a Standard Legend in the corner of the graphic. Graphics, except pop-ups, to have the date and time displayed in the upper corner of the graphic. Each graphic titled.

C. Weather: Graphics, except pop-ups, to have the outdoor temperature and humidity in the upper corner of the graphic.

D. Alarms: System and component summary alarms located near the top of each relevant graphic screen. Provide links to the associated system/component as part of these tags to assist trouble shooting. Other alarms placed near the associated system/device as depicted in the graphic. Provide text and color of information tags that describe each object and alarm value consistent with a graphics color legend.

E. The Following Graphics Provided as a Minimum:
   1. A building graphic, typically a photograph of the building, with links to each floor plan and other links as defined below.
   2. A central plant graphic with equipment (chillers, boilers, pumps, heat exchangers, storage tanks, etc.), temperature sensors, pressure sensors, flow sensors and refrigeration leak detectors. The central plant graphic to have links to each building on the campus.
   3. Central equipment such as air handler, package rooftop equipment, supply fans, exhaust fans, and smoke control systems.
   4. Floor plans of each floor, with temperature sensors, pressure sensors, temperature control zones, heating/cooling zones, ventilation zones, and supply air zones identified. Rooms grouped on a graphic only to the extent that detailed and complete sensing information can be comfortably viewed by an operator and the bound points updated in less than 10 seconds. Each zone to have a temperature symbol that changes the entire color over the range from low (blue) through normal (green) to high (red) and indicate an alarm (flashing red). The zone temperature and or pressure symbol(s) to be a link to a zone control pop-up graphic. Individual floor plan graphics to provide links to related mechanical systems. The mechanical room plan graphics to show the relative location of, and provide links to, either the equipment pop-up or flow and control graphic for mechanical equipment monitored or controlled by the BAS.
   5. Pop-up graphics provided for each zone control system showing a flow diagram and related monitoring and control points and system parameters. Pop-up graphics provided for each piece of equipment that is not shown on a flow and control graphic.
   6. Flow and control diagrams for each system including but not limited to packaged equipment, heating hot water systems, pumps, zone terminal units, combination fire and smoke dampers status, ventilation systems. The flow and control graphics to have parameters grouped in the lower portion of the graphics. Standard equipment graphics used. Pumps, fans, dampers and other elements to dynamically indicate their state (i.e. pumps and fans to rotate when on and damper positions to dynamically adjust and be shown in their current position, etc.) and their commanded position. System flow and control graphics displayed in a general left to right flow or loop arrangement. Return and exhaust air flow shown on top and return water shown on the bottom of the graphic.
   7. Individual equipment/component screens showing sensing and control information available for each device provided.
   8. Equipment settings tab that includes all relevant equipment operating procedures listed a neat an orderly fashion.
   9. All test boxes on one graphic shall be of the same size and font.
   10. Graphics shall match standard graphic pages at other County Sites.
   11. All actuated devices shall include a percent open or closed indicator.
   12. All graphics shall illustrate installed equipment accurately.
   13. Provide a rooftop graphic with location of all rooftop equipment with hyperlinks to all equipment graphic pages

14. All floor plans shall include diffuser, duct branch, and VAV location
15. All floor plans shall include exact location of all thermostats
16. All VAV graphics, regardless of type, shall include incoming air temperature and discharge air temperature
17. Shall include all mechanical as-builts and sequence of operations on the home page
18. All VAV graphics shall include the lighting relay status and command.

F. Penetration: The graphic interface to consistently apply a convention whereby a left-click to always penetrate to more detailed information. The text windows to represent the deepest level of penetration. A right-click to always produce a menu of options that are specific to the item selected.

G. Navigation: Graphics organized to provide a "branching structure" that allows an operator to move from a "macro view" to a "micro view" and return. These links to other associated graphics, or allow a return to a previous macro view, provided and arranged horizontally along the bottom of each graphic screen. From left to right, the graphic links as follows: site/building map, building/trailer floor plans, and major mechanical systems at each building. Pop-up right click menus provided as needed on the lower button bar to allow for uncluttered navigation.

H. Clutter Minimization: Each graphic to have separate check boxes in the lower right corner that show/hide set points, alarms/safeties, and devices/equipment.

I. Templates: To the maximum extent possible, use standard graphics as templates to provide a consistent look throughout the interface.

J. Color Scheme: The graphics to use dynamic color changes to communicate equipment type, or object status/mode consistent with the graphics color legend.

K. Symbols and Animations: Fans, pumps, dampers, coils, and generation equipment to be dynamic symbols indicating rotation, state, or position, movement, flow, etc.

L. Macros: When macros are used to add functionality to the graphics, detailed documentation provided.

M. Configure Mode: Access to “Configure Mode” for editing of the graphics password protected to prevent unauthorized changes to the graphics. This password supplied to the appropriate personnel.

N. Graphics Version: Graphics provided in the most current format available at time of control system programming.

O. Points and graphics checked for the proper binding and graphic programming, settings to ensure that the correct system, location, point values and dynamics are shown in the proper location and rotate in the proper directions.

P. After graphics have been accepted, provide, on a CD ROM in an agreed upon file structure. If the graphics have active-x controls or other files that must be placed outside the graphics folder structure a set-up program provided on the disk to place the files in the correct locations.

2.7 BUILDING CONTROLLERS

A. General: Provide adequate number of building controllers to achieve performance specified. Panels to meet the following requirements.
   1. Building Automation System (BAS) to be composed of one or more independent, stand-alone, microprocessor-based building controllers to manage global strategies described in Controller Software Section.
   2. Provide sufficient memory to support operating system, database, and programming requirements.
   3. Share data between networked building controllers.
   4. Distributed controllers to share real and virtual object information and allow for central monitoring and alarms.
   5. Controllers that perform scheduling have real-time clock.
   6. Continually check status of its processor and memory circuits and if abnormal operation is detected, controller:
      a. Assume predetermined failure mode.
      b. Generate alarm notification.
   7. Building Controller communicates with other devices on internetwork including BACnet communications according to specified protocol.
   8. All controllers must have a unique device ID on entire county's network (Nav tree on graphics).

B. Communication:
   1. Each building controller resides on network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and performs routing to network of custom application and application specific controllers.
   2. Controller provides a service communication port for connection to a portable operator's terminal.

C. Environment:
   1. Controllers used outdoors and/or in wet ambient conditions mounted within NEMA waterproof enclosures and rated for operation at 0 degrees F to 150 degrees F.
   2. Controllers used in conditioned space be mounted in NEMA dust-proof enclosures and rated for operation at 32 degrees F to 120 degrees F.

D. Serviceability: Provide diagnostic LEDs for power, communication, and processor. Wiring connections be made to modular terminal strips or to termination card connected by ribbon cable.

E. Memory: Building controller maintains BIOS and programming information in event of power loss for at least 72 hours.

F. Immunity to power and noise. Controller able to operate at 90 percent to 110 percent of nominal voltage rating and performs an orderly shutdown below 80 percent nominal voltage. Operation be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 3-feet.

G. Controller to have a battery to provide power for orderly shutdown of controller and storage of data in nonvolatile flash memory. Battery backup to maintain real-time clock functions for a minimum of 10 days.

2.8 APPLICATION SPECIFIC CONTROLLERS

A. Application specific controllers (ASCs) are microprocessor-based DDC controllers, which through hardware or firmware design are dedicated to control a specific piece of equipment. Controllers to be fully programmable using graphical programming blocks.
   1. ASC controllers communicate with other devices on internetwork.
   2. Each ASC capable of stand-alone operation without being connected to network.
   3. Each ASC will contain sufficient I/O capacity to control target system.
   4. Application controllers to include universal inputs with minimum 10-bit resolution that accept thermistors, 0-10VDC, 0-5 VDC, 4-20 mA and dry contact signals. Any input on a controller may be either analog or digital with at least 1 input that accepts pulses. Controller to also include support and modifiable programming for interface to intelligent room sensor with digital display. Controller to include binary and analog outputs on board. Provide analog outputs switch selectable as either 0-10VDC or 0-20mA. Software to include scaling features for analog outputs. Application controller to include 24VDC voltage supply for use as power supply to external sensors.
   5. Program sequences stored on board application controller in EEPROM. No batteries needed to retain logic program. Program sequences executed by controller 10 times per second and capable of multiple PI and PID loops for control of multiple devices. Calculations completed using floating-point math and system to support display of information in floating-point nomenclature at operator's terminal. Programming of application controller completely modifiable in the field over installed BAS LANs or remotely via modem interface. Operator to program logic sequences by graphically moving function blocks on screen and tying blocks together on screen.
   6. Application controller to include support for room sensor. Display on room sensor programmable at application controller and include an operating mode and a field service mode. Provide button functions and display data programmable to show specific controller data in each mode based on which button is pressed on the sensor. See sequence of operation for specific display requirements at intelligent room sensor.

B. Communication:
   1. Controller resides on network using MS/TP Data Link/Physical layer protocol.
   2. Each controller connected to building controller.
   3. Each controller capable of connection to laptop computer or portable operator's tool.

C. Environment:
   1. Controllers used outdoors and/or in wet ambient conditions mounted within NEMA waterproof enclosures and rated for operation at 0 degrees F to 150 degrees F.
   2. Controllers used in conditioned space mounted in NEMA dust-proof enclosures and rated for operation at 32 degrees F to 120 degrees F.

D. Serviceability: Provide diagnostic LEDs for power, communication, and processor.

E. Memory: ASC use nonvolatile memory and maintains BIOS and programming information in event of power loss.

2.9 ADVANCED APPLICATION CONTROLLERS

A. General:
   1. Expandable application controller capable of providing control strategies for the system based on information from any or all connected inputs. Provide program implementing these strategies completely flexible and user definable. Provide program execution of controller a minimum of once per second.
   2. Programming: Object-oriented using control program blocks. Controller to support a minimum of 500 Analog Values and 500 Binary Values. Each and every analog and binary value to support standard specified protocol priority arrays.
   3. Provide means to graphically view inputs and outputs to each program block in real-time as program is executing. This function may be performed via the operator's terminal or field computer.
   4. Controller to have adequate data storage to ensure high performance and data reliability. Battery to retain static RAM memory and real-time clock functions for a minimum of 1.5 years (cumulative). Provide field-replaceable battery (non-rechargeable) lithium type. Unused battery life: 10 years.
   5. The onboard, battery-backed real time clock must support schedule operations and trend logs.
   6. Global control algorithms and automated control functions should execute via 32-bit processor.
   7. Controller to include both on-board Ethernet specified protocol communication over twisted pair cable (UTP) and to include specified protocol IP communication. In addition, controller to include specified protocol PTP connection port.
   8. The base unit of the controller to host up to 8 expansion modules with various I/O combinations. These inputs and outputs to include universal 12-bit inputs, binary triac outputs, and 8-bit switch selectable analog outputs (0-10V or 0-20 mA).

Inputs to support thermistors, 0-5VDC, 0-10VDC, 4-20mA, dry contacts and pulse inputs directly.

9. Outputs must have onboard Hand-Off-Auto switches and a status indicator light. HOA switch position to be monitored. Each analog output to include a potentiometer for manually adjusting the output when the HOA switch is in the Hand position.
10. The position of each and every HOA switch to be available system wide as a specified protocol object. Expandable Controller to provide up to 176 discreet inputs/outputs per base unit.

B. Schedules: Each controller to support a minimum of 50 Schedule Objects.

C. Logging Capabilities: Each controller to support a minimum of 200 trend logs. Any object in the system (real or calculated) may be logged. Sample time interval adjustable at the operator's workstation.

D. Alarm Generation:
1. Alarms may be generated within the system for any object change of value or state either real or calculated. This includes things such as analog object value changes, binary object state changes, and various controller communication failures.
2. Alarm log provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site via remote communications.
3. Controller must be able to handle up to 200 alarm setups stored as event enrollment objects - system destination and actions individually configurable.

2.10 APPLICATION SPECIFIC CONTROLLER - TERMINAL UNIT CONTROLLERS

A. Provide one application controller for each terminal unit that adequately covers objects listed in object list for unit. Controllers to interface to building controller via LAN using specified protocol. Controllers to include on board flow sensor, inputs, outputs and programmable, self-contained logic program as needed for control of units.

B. Application controllers to include universal inputs with 10-bit resolution that can accept thermistors, 0-5 VDC, and dry contact signals. Inputs on controller may be either analog or digital. Controller to also include support and modifiable programming for interface to intelligent room sensor with digital display (digital display to indicate set point only). Controller to also include binary outputs on board. For applications using variable speed parallel fans, provide a single analog output selectable for 0-10 V or 0-20 mA control signals. Application controller to include microprocessor driven flow sensor for use in pressure independent control logic. Terminal units controlled using pressure independent control algorithms and flow readings to be in CFM.

C. Program sequences stored on board application controller in EEPROM. No batteries needed to retain logic program. Program sequences executed by controller 10 times

per second and capable of multiple PI loops for control of multiple devices. Provide programming of application controller completely modifiable in the field over installed specified protocol LANs or remotely via modem interface. Operator to program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Application controller programmed using the same programming tool as Building Controller and as described in operator workstation Section.

D. Application controller to include support for intelligent room sensor. Display on room sensor programmable at application controller and include an operating mode and a field service mode. Button functions and display data programmable to show specific controller data in each mode based on which button is pressed on the sensor. See sequence for specific display requirements for intelligent room sensor.

E. Provide duct temperature sensor at discharge of each terminal unit that is connected to controller for reporting back to operator workstation. Provide analog inputs for the duct temperatures.

2.11 INPUT/OUTPUT INTERFACE

A. Input/output points protected such that shorting of point to itself, to another point, or to ground will cause no damage to controller. Input and output points protected from voltage up to 24 V.

B. Binary inputs (BI or DI) allow monitoring of On/Off signals from remote devices. Binary inputs sense “dry contact” closure without external power (other than that provided by controller) being applied.

C. Pulse accumulation input objects accept up to 10 pulses per second for pulse accumulation.

D. Analog inputs (AI) allow monitoring of low-voltage (0 to 10 VDC), current (4 to 20 mA), or resistance signals (thermistor, RTD).

E. Binary outputs (BO or DO) provide for On/Off operation or pulsed low-voltage signal for pulse width modulation control. Binary outputs on building and custom application controllers have three-position (On/Off/Auto) override switches and status lights. Outputs selectable for either normally open or normally closed operation.

F. Analog outputs (AO) provide a modulating signal for control of end devices. Outputs provide either a 0 to 10 VDC or a 4 to 20 mA signal as required to provide proper control of the output device. Analog outputs on building controllers have status lights and two-position (AUTO/MANUAL) switch and adjustable potentiometer for manual override. Analog outputs not exhibit drift of greater than 0.4 percent of range per year.

G. Tri-State Outputs. Provide tri-state outputs (two coordinated binary outputs) for control of three-point floating type electronic actuators without feedback. Use of

three-point floating devices limited to zone control and terminal unit control applications (VAV terminal units, duct-mounted heating coils, zone dampers, radiation, etc.). Control algorithms run zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.

H. Naming: All I/Os shall be named so that equipment that is controlled can be easily identified. Contractor shall meet with owner to confirm and receive written approval for naming convention. If work proceeds without written approval, Contractor may be required to rename all points to Owners approval.

2.12 POWER SUPPLIES AND LINE FILTERING

A. Control transformers UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in both primary and secondary circuits. Limit connected loads to 80 percent of rated capacity.

B. DC power supply output match output current and voltage requirements. Unit operates between 32 degrees F and 120 degrees F.

C. Line voltage units UL listed and CSA approved.

D. Power line filtering. Provide transient voltage and surge suppression for workstations and controllers.

2.13 CONTROL PANELS

A. Control Panels:
   1. Enclosures may be NEMA 1 when located in a clean, dry, indoor environment. Indoor enclosures to be NEMA 12 when installed in other than a clean environment. Outdoor enclosures must be NEMA 3R. Provide (hinged door) key-lock latch and removable subpanels. Single key common to field panels and subpanels. In existing campus or building settings, key lock to match existing keys.
   2. Interconnections between internal and face-mounted devices prewired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections UL listed for 600 volt service, individually identified per control/ interlock drawings, with adequate clearance for field wiring. Control terminations for field connection individually identified per control drawings.
   3. Provide ON/OFF power switch with overcurrent protection for control power sources to each local panel.
   4. Provide laminated plastic nameplates for enclosures in any mechanical room or electrical room labeled with TCP number. Laminated plastic to be 1/8-inch thick sized appropriately to make label easy to read.

2.14 AUXILIARY CONTROL DEVICES

A. Temperature Instruments:
   1. Room Temperature Sensor: Thermistor or platinum RTD type with accuracy of plus or minus 0.5 degrees F at 70 degrees F; operating range 30-120 degrees F; linear signal; single point sensing element in wall-mounted ventilated enclosure with insulating back plate if mounted on exterior wall; push button for occupancy override; digital set point adjustment plus or minus 2 degrees F in both directions; LCD temperature display indicating set point only. set point adjustment to revert to building programmed standard temperature upon next building occupancy schedule change (user adjustable). Room temperature sensor may have integral space carbon dioxide sensor with minimum performance characteristics identified within this specification. Include integral occupancy sensor for public rooms but not in offices.
   2. Averaging Duct Temperature Sensors: Thermistor or platinum RTD element with accuracy of plus or minus 0.5 degrees F at 32 degrees F, consisting of array of single point sensing elements, securely mounted in duct or plenum; operating range 20-120 degrees F; linear signal; 1-foot element per 2 SF of duct cross Sectional area. Use when duct is 9 SF or larger or where air is subject to temperature stratification.
   3. Probe Duct Temperature Sensors: Thermistor or platinum RTD element with accuracy of plus or minus 0.5 degrees F at 32 degrees F, consisting of single point sensing elements, securely mounted in duct or plenum; operating range 20-120 degrees F; linear signal; 24-inch rigid probe. Use where duct is less than 9 SF cross Sectional area.
   4. Outside Air Temperature Sensor: Thermistor or platinum RTD element with accuracy of plus or minus 0.5 degrees F at 32 degrees F; Range -58 to 120 degrees F, single element, linear, with weather and sun shield for exterior mounting.
   5. Low Temperature Limit Thermostat: Minimum 20 foot capillary sensing element, triggering on low temperature as sensed by any 12-inch segment; snap acting, normally open contacts, manual reset, line voltage.
   6. Liquid Immersion Temperature Sensor: Thermistor or platinum RTD element, with accuracy of plus or minus 0.5 degrees F at 32 degrees F, stainless steel well and assembly, range 30 to 250 degrees F.

B. Pressure Transmitters and Transducers:
   1. Transducer have linear output signal; field adjustable zero and span. Sensing elements withstand continuous operating conditions of positive or negative pressure 50 percent greater than calibrated span without damage.
   2. Differential Pressure Switch: set point adjustable with operating range of 0.5 to 12-inch WG for fans, and 5 to 30-feet WC for pumps. Switches UL listed; SPDT snap-acting; pilot duty rated (125 VA minimum); NEMA 1 enclosure; scale range and differential suitable for intended application.
   3. Filter Differential Pressure Switch: set point adjustable with operating range of 0.1 to 5-inch WG; auto reset. Contactor to close when pressure differential setting

is met or exceeded. Provide mounting bracket, metallic tubing and appropriate fittings for connection to duct or air-handling unit.

4. Duct Static Differential Pressure Transducer: Operating range 0 to 5-inch WC for duct mounted transmitter; ceramic capacitive sensing element with probe securely mounted in duct; digital input terminal and push button to zero output. Accuracy plus or minus 1 percent of full scale; maximum response time 2 seconds.
5. Building Static Pressure Transducer: Operating range of -0.1 to 0.1-inch WC, linear signal. Sensing tubes located inside and outside building use shielding and/or surge tanks to minimize effects of wind. Accuracy plus or minus 1 percent of full scale.
6. Piping Pressure Transmitter: Operating range 0 to 50 PSIG, linear signal; stainless steel diaphragm; digital input terminal and push button to zero output. Accuracy plus or minus 1 percent of full scale.

C. Motorized Control Dampers:
1. Performance: Maximum leakage of 3 CFM/SF at 1-inch WG differential pressure, AMCA Class 1A, maximum pressure rating of 13-inch WG differential pressure, maximum velocity of 6,000 fpm, -72 degrees F to 275 degrees F temperature rating.
2. Multi-blade type, except where either dimension is less than 10-inch single blade may be used. Maximum blade length to be 48-inch.
3. Provide parallel blades for modulating mixing service and opposed blades for throttling service.
4. Blades to be interlocking; minimum 16 gauge galvanized steel; compression type edge seals and side seating stops. In copper, aluminum and stainless steel duct work, damper material matches duct work material.
5. Damper blades be reinforced, have continuous full length axle shafts, axle to axle linkage, and/or operating “jackshafts” as required to provide coordinated tracking of blades.
6. Bearings: Self-lubricating stainless steel sleeve or Celcon bearing.
7. Dampers over 25 SF in area to be in two or more sections, with interconnected blades.
8. Provide remote damper blade position status with binary input.
9. Tested in accordance with AMCA Standard No. 500.

D. Motorized Control Valves:
1. Body pressure rating and connection type construction conforms to pipe, fitting and valve schedules.
2. Fluid valve close-off ratings and spring ranges operate at maximum flows and maximum available pump heads scheduled without leakage.
3. Screwed ends except 2-1/2-inch and larger valves with flanged ends.
4. Pressure Independent Modulating Control Valves:
    a. Description: Valve consists of pressure compensating cartridge, actuated ball or Y pattern globe valve, and multiple pressure/temperature test ports in a single valve housing.

b. Construction: Rated for no less than 125 PSI and 250 degrees F. 2-inch and Smaller: brass with threaded connections. 2-1/2-inch and larger: cast iron with flanged connections.
c. Performance: Flow rate controlled linearly to within 5 percent of target flow rate, for any actuator position (0 to 100 percent), over an operating differential pressure range of 6 to 50 PSI across the valve. Provide valve with integral test ports to verify pressure differential.
d. Manufacturers: Belimo, Danfoss, Flow Control Industries, Griswold, Tour and Andersson or approved equivalent.

5. Fluid three-way valves globe valves with linear plug with composition disc for tight shutoff.
6. Pressure drop equal to twice pressure drop through heat exchanger (load), 50 percent of pressure difference between supply and return mains, or 5 PSI, whichever is greater, except two-position valves be line size.
7. Bubble-tight line size butterfly valves acceptable on 2-1/2-inch lines and above for two-position action only; cast iron body; aluminum bronze disc; EPDM seat, 200 PSI wg

E. Electric Damper/Valve Actuators:
1. Provide mechanical or electronic stall protection for each actuator.
2. Where indicated provide internal mechanical, spring-return mechanism or provide uninterruptible power supply (UPS). Non-spring-return actuators have external manual gear release to position damper/valve when actuator is not powered.
3. Proportional actuators accepts 0 to 10 VDC or 0 to 20 mA control signal and provide 2 to 10 VDC or 4 to 20 mA operating range.
4. Actuator sized for torque required plus 25 percent; UL or CSA listed; electronic current overload protection.
5. VAV Actuators: Actuators proportional 24 VAC actuators using a 4 to 20 mA range of control signals; stops automatically at end of travel; include permanently lubricated gear train.

F. Water Flow Meter:
1. Provide a Turbine Flow Meter (reference 23 05 19) complete with installation hardware necessary to enable insertion and removal of the meter without system shutdown. The flow meter hand-insertable up to 400 PSI. The flow meter to have two contra-rotating axial turbines, with electronic impedance-based sensing and an averaging circuit to reduce measurement errors due to swirl and flow profile distortion. Wetted metal components nickel-plated brass. Provide 316L SS construction for hot water applications operating over 250 degrees F, and for any application in non-metallic pipe. The maximum operating temperature 280 degrees F, 300 degrees F peak. Each flow meter individually wet-calibrated against a primary volumetric standard that is accurate to within 0.1 percent and traceable to NIST*. Manufacturer's certificate of calibration provided with each flow meter. Accuracy within plus or minus 0.5 percent of rate at the calibrated velocity, within plus or minus 1 percent of rate over a 10:1 turndown (3.0 to 30 ft/s) and within plus or minus 2 percent of rate over a 50:1 turndown (from 0.4 to

20 ft/s). The flow meter to include integral analog output(s), 4-20 mA, 0-10V, or 0-5V. Flow meter covered by the manufacturer's two year warranty.

G. Wall Mounted Space Carbon Dioxide Sensor:
   1. Sensor to employ non-dispersive infrared technology. (N.D.I.R.)
   2. Sensor Repeatability: Plus or minus 20 ppm. 0-2000.
   3. Sensor Accuracy: Less than or equal to 75 ppm over 0-1500 ppm range.
   4. Sensor Response Time: Less than 1 minute.
   5. Sensor to employ reference channel design for long-term stability.
   6. Sensor to have field selectable 0-10VDC, or 4-20mA outputs.
   7. Sensor power requirement less than 3W.
   8. Sensor Input Voltage: 20 to 30VAC/DC.
   9. Sensor Operating Temperature Range: 0 degrees C to 50 degrees C.
   10. Sensor to have models for wall mounting or duct mounting.
   11. Sensor to provide at least a 1-year factory warranty from date of purchase.
   12. Sensor to match cover in color and look to temperature sensor.
   13. Sensor to have display.
   14. Manufacturers:
      a. Telaire
      b. Vaisala
      c. Veris

H. Occupancy Sensor: Dual technology infrared and ultrasonic sensing device, ceiling or wall mounted, built-in self-adjusting settings, timer settings of 30 seconds to 30 minutes, with manual and automatic modes. Provide multiple devices in parallel when area served is greater than a single device sensing capability. Provide integral power pack, 120 VAC input, 24 VDC output, with manual override switch. Leviton OSC-MOW series.

I. Relays:
   1. Control relays UL listed plug-in type with dust cover and LED “energized” indicator. Contact rating, configuration, and coil voltage be suitable for application.
   2. Time delay relays UL listed solid-state plug-in type with adjustable time delay. Delay adjustable plus or minus 200 percent (minimum) from set point or as indicated. Contact rating, configuration, and coil voltage be suitable for application. Provide NEMA 1 enclosure when not installed in local control panel.

J. Current Transmitters:
   1. AC current transmitters be self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4 to 20 mA two-wire output. Unit ranges 10 A full scale, with internal zero and span adjustment and plus or minus 1 percent full-scale accuracy at 500 ohm maximum burden.
   2. Transmitter meets or exceeds ANSI/ISA S50.1 requirements and UL/CSA recognized.

3. Unit split-core type for clamp-on installation on existing wiring.

K. Current Transformers: AC current transformers UL/CSA recognized and completely encased (except for terminals) in approved plastic material; plus or minus 1 percent accuracy at 5 A full-scale.

L. Voltage Transmitters: AC voltage; self-powered single-loop (two-wire) type; 4 to 20 mA output with zero and span adjustment; UL/CSA recognized at 600 VAC rating and meet or exceed ANSI/ISA S50.1. Ranges include 100 to 130 VAC, 200 to 250 VAC, 250 to 330 VAC, and 400 to 600 VAC full-scale, adjustable, with plus or minus 1 percent full-scale accuracy with 500 ohm maximum burden.

M. Voltage Transformers: AC voltage transformers UL/CSA recognized, 600 VAC rated; built-in fuse protection; suitable for ambient temperatures of 40 degrees F to 130 degrees F; plus or minus 0.5 percent accuracy at 24 VAC and a 5 VA load.

N. Power Monitors: Selectable rate pulse output for kWh reading; 4-20 mA output for kW reading; N.O. alarm contact; ability to operate with 5.0 amp current inputs or 0-0.33 volt inputs; plus 1.0 percent full-scale true RMS power accuracy; plus 0.5 Hz, voltage input range 120-600 V, and auto range select; NEMA 1 enclosure. Current transformers having a 0.5 percent FS accuracy, 600 VAC isolation voltage with 0-0.33 V output. If 0-5 A current transformers are provided, a three-phase disconnect/shorting switch assembly is required.

O. Overflow Switch: Insertion flow sensor, brass, impeller flow design with analog transmitter unit. Data Industrial Model 220BR.

P. Ultrasonic Level Transmitter: Non-contact measuring device for liquid level; distance ranges from 4-feet to 32-feet; fail-safe intelligence with diagnostic feedback for troubleshooting; automatic temperature compensation; 24VDC; accuracy plus 0.15 percent of span in air. Kele LU Series.

Q. End Switches: Turret head Type SPDT. Square D Class 9007, Type C54B2, or equal.

2.15 WIRING AND RACEWAYS

A. General: Provide copper wiring, plenum cable, and raceways as specified in applicable Sections of Division 26, Electrical.

B. Insulated wire to be copper conductors, UL labeled for 90 degrees C minimum service.

C. Run control wiring as follows:
1. Mechanical Rooms: In conduit.
2. Exposed in Building Spaces: In conduit.
3. Concealed in Building Walls and Ceilings: Plenum rated cable.
4. Concealed in Building Ceilings: Plenum rated cable in cable tray.

D. Field and Subfield Panels: Voltage in panels not-to-exceed 120 volts.

E. Motor Control Centers: Responsibility for correct voltage of holding coils and starter wiring in pre-wired motor control centers interfacing with automatic controls is included hereunder.

F. Wiring for BAS systems communications buses two conductor minimum 18 gauge foil-shielded, stranded twisted pair cable rated at 300 VDC or more than 80 degrees C.

2.16 SMOKE DETECTION (FOR PROJECTS WITH A FIRE ALARM SYSTEM)

A. See Division 28 for Products.

PART 3 - EXECUTION

3.1 DEMOLITION

A. Terminal Devices: Remove terminal sensors, actuators and controls as indicated on drawings and as required to accommodate scope of mechanical work shown on drawings and described in specifications. Remove pneumatic piping and cap with hardware as appropriate. Remove wiring and conduit associated with devices. Do not leave any unused abandoned piping or wiring in space.

B. Graphics and Programming: Remove symbols from control system graphics associated with deleted terminal elements. Modify programming code to delete alarms, control loops, etc., associated with deleted terminal devices.

3.2 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence.

B. Notify the Owners' representative in writing of conditions detrimental to the proper and timely completion of the work.

C. Do not begin work until unsatisfactory conditions are resolved.

3.3 CONTROL SYSTEM CHECKOUT AND TESTING

A. Testing completed before Owner's representative is notified of system demonstration.

B. Calibrate and prepare for service of instruments, controls, and accessory equipment furnished under this specification.

C. Verify that control wiring is properly connected and free of shorts and ground faults.

D. Enable control systems and verify calibration and operation of input and output devices.

E. Verify that system operation adheres to sequences of operation.

F. Commissioning and Verification: In addition to commissioning requirements specified elsewhere, provide the following commissioning on the HVAC instrumentation and controls system:
   1. Control systems completely commissioned to ensure aspects of the system are operating as intended and at optimum tuning.
   2. Wiring connections verified and traced from field device to panel to ensure proper connections.
   3. Measured values verified by a hand held calibrated device to validate that value indicated by the control system is in fact the actual measured value.
   4. Loops properly tuned to obtain the desired control value. Each loop to be "upset" and put back in control to demonstrate its ability to stabilize quickly.
   5. Provide a final point-by-point report submitted that indicates the date of each verification, the results, and initialed on each page by the person performing the reading.

3.4 ACCEPTANCE TESTING AND TRAINING

A. Site Testing:
   1. Contractor provides personnel, equipment, instrumentation, and supplies necessary to perform testing. Owner or Owner's representative will witness and sign off on acceptance testing.
   2. Contractor demonstrates compliance of completed control system with Contract Documents. Using approved test plan, physical and functional requirements of project demonstrated.

B. Training:
   1. General: Contractor conducts training courses for up to 3 other designated personnel in operation and maintenance of system. Training manuals provided for each trainee, with two additional copies provided for archival at project site. Manuals include detailed description of subject matter for each lesson. Copies of audiovisuals delivered to Owner. Training day is defined as 8 hours of classroom instruction, including two 15-minute breaks and excluding lunch time, Monday through Friday, during normal first shift in effect at training facility. Notification of any planned training given to Owner's representative at least 15 days prior to training.
   2. Operator's Training I: First course taught at supplier's facility for period of one consecutive training days. Upon completion, each student should be able to perform elementary operations with guidance and describe general hardware architecture and functionality of system.
   3. Operator's Training II: Second course taught at project site for a period of one training day after completion of contractor's field testing. Course includes

instruction on specific hardware configuration of installed system and specific instructions for operating installed system. Upon completion, each student should be able to start system, operate the system, recover system after failure, and describe specific hardware architecture and operation of system.

4. Operator's Training III: Third course taught at project site for period of one training day no later than six months after completion of the acceptance test. Course will be structured to address specific topics that students need to discuss and to answer questions concerning operation of system. Upon completion, students should be fully proficient in system operation and have no unanswered questions regarding operation of installed system.

3.5 WIRING

A. Provide electrical wiring required to control systems specified in this Section. Control and interlock wiring complies with national, state and local electrical codes and Division 26, Electrical of this specification.

B. Power wiring required for building control panel(s) to be dedicated circuit(s).

C. Verify location of operator work station with Owner prior to installation.

D. NEC Class 1 (line voltage) wiring UL Listed in approved raceway according to NEC and Division 26, Electrical requirements.

E. Low-voltage wiring meets NEC Class 2 requirements. (Low-voltage power circuits subfused when required to meet Class 2 current limit.)

F. Where NEC Class 2 (current-limited) wires are in concealed and accessible locations, including ceiling return air plenums, approved cables not in raceway may be used provided that cables are UL listed for intended application.

G. Do not install Class 2 wiring in raceway containing Class 1 wiring. Boxes and panels containing high-voltage wiring and equipment may not be used for low-voltage wiring except for purpose of interfacing (e.g., relays and transformers).

H. Where Class 2 wiring is run exposed, wiring run parallel along surface or perpendicular to it and tied at 10 foot intervals.

I. Where plenum cables are used without raceway, support from structural members. Do not support cables with ductwork, electrical raceways, piping, or ceiling suspension systems.

J. Make wire-to-device connections at terminal block or terminal strip. Make wire-to-wire connections at terminal block.

K. Maximum allowable voltage for control wiring 24 V. If only higher voltages are available, provide step-down transformers.

L. Wiring installed as continuous lengths, with no splices permitted between termination points.

M. Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at penetrations.

N. Include one pull string in each raceway 1-inch or larger.

O. Control and status relays are to be located in designated enclosures. Enclosures include packaged equipment control panels unless they also contain Class 1 starters.

P. Install raceway to maintain a minimum clearance of 6-inches from high-temperature equipment (e.g., steam pipes or flues).

Q. Secure raceways with raceway clamps fastened to structure and spaced according to code requirements. Raceways and pull boxes may not be hung on flexible duct strap or tie rods. Raceways may not be run on or attached to ductwork.

R. Install insulated bushings on raceway ends and openings to enclosures. Seal top end of vertical raceways.

S. Flexible metal raceways and liquid-tight, flexible metal raceways not-to-exceed 3-feet in length and be supported at each end. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal raceways to be used.

T. Raceway must be rigidly installed, adequately supported, properly reamed at both ends, and left clean and free of obstructions. Raceway Sections joined with couplings. Terminations made with fittings at boxes.

U. Input and output terminations to be labeled at the controller to identify if they are AI, DI, AD, DO, and function (i.e. pump start, OM Sensor.)

3.6 COMMUNICATION WIRING

A. Follow manufacturer's installation recommendations for communication cabling.

B. Verify integrity of network following cable installation.

C. Communication wiring unspliced length when that length is commercially available; labeled to indicate origination and destination data.

D. Grounding of coaxial cable in accordance with NEC regulations article on “Communications Circuits, Cable, and Protector Grounding.”

3.7 INSTALLATION OF AUXILIARY CONTROL DEVICES

A. General:
   1. Install sensors and thermostats in accordance with manufacturer's recommendations.
   2. Room sensors and thermostats installed at 48-inches AFF to midline of sensor on concealed junction boxes properly supported by wall framing at the locations shown on the Drawings.
   3. Low-limit sensors used in mixing plenums installed in a serpentine manner horizontally across duct.
   4. Pipe-mounted temperature sensors installed in wells with heat-conducting fluid in thermal wells.
   5. Install outdoor air temperature sensors on north facing wall or screen, complete with sun shield at designated location.

B. Flow Switch: Use correct paddle for pipe diameter. Adjust flow switch in accordance with manufacturer's instructions.

C. Actuators:
   1. General:
      a. Mount and link control damper actuators according to manufacturer's instructions.
      b. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
   2. Actuator Mounting for Damper and Valve Arrangements to Comply with the Following:
      a. Damper Actuators: Do not install in the air stream.
      b. Use a weather proof enclosure (clear and see through) if actuators are located outside.
      c. Damper or valve actuator ambient temperature not-to-exceed 122 degrees F through any combination of medium temperature or surrounding air. Provide appropriate air gaps, thermal isolation washers or spacers, standoff legs, or insulation as necessary. Mount per manufacturer's recommendations.
      d. Actuator cords or conduit to incorporate a drip leg if condensation is possible. Do not allow water to contact actuator or internal parts. Location of conduits in temperatures dropping below dew point to be avoided to prevent water from condensing in conduit and running into actuator.
      e. Damper mounting arrangements to comply with the following:
         1) Furnish and install damper channel supports and sheet metal collars.
         2) Jack shafting of damper Sections not allowed.
         3) Multi-Section dampers arranged so that each damper Section operates individually. Provide one electronic actuator direct shaft mounted per Section.
      f. Size damper Sections based on actuator manufacturers specific recommendations for face velocity, differential pressure and damper type. In

general: Damper Section not-to-exceed 24 ft-sq. with face velocity 1500 FPM.

g. Multiple Section dampers of two or more arranged to allow actuators to be direct shaft mounted on the outside of the duct.

h. Multiple Section dampers of three or more Sections wide arranged with a 3-sided vertical channel (8-inch wide by 6-inch deep) within the duct or fan housing and between adjacent damper Sections. Vertical channel anchored at the top and bottom to the fan housing or building structure for support. Connect sides of each damper frame to the channels. Holes in the channel to allow damper drive blade shafts to pass through channel for direct shaft mounting of actuators. Face open side of channel downstream of the airflow, except for exhaust air dampers.

i. Multiple Section dampers to be mounted flush within a wall or housing opening to receive either vertical channel supports as described above or sheet metal standout collars. Sheet metal collars (12-inch minimum) to bring each damper Section out of the wall to allow direct shaft mounting of the actuator on the side of the collar.

D. Control Valve:

1. Valves installed in accordance with manufacturer's recommendations.
2. Slip-stem control valves installed so that stem position is not more than 60 degrees from vertical up position. Ball type control valves installed with stem in horizontal position.
3. Control valves accessible and serviceable.
4. Install isolation valves so that control valve may be serviced without draining supply/return side piping system. Install unions at connections to screw-type control valves.
5. Valve Sizing for Water Coil:
   a. On/Off Control Valves: Line size.
   b. Modulating Control Valve Body Size may be reduced at most two pipe sizes from the line size or not less than 1/2 the pipe size. BAS contractor to size all water coil control valves for the application as follows:
      1) Booster-heat valves sized not-to-exceed 4-9 PSI differential pressure. Size valve for 50 percent Valve Authority. Valve design pressure drop is equal to the sum of coil drop plus the balance valve drop.
      2) Primary valves sized not-to-exceed 5-15 PSI differential pressure. Size valve for 50 percent Valve Authority. Valve design pressure drop is equal to the sum of coil drop plus the balance valve drop.
      3) Butterfly valves sized for modulating service at 60-70 degree rotation. Design velocity 12-feet per second or less when used with standard EPDM seats.
   c. Valve Mounting Arrangements to Comply with the Following:
      1) Provide unions on all ports of two-way and three-way valves.
      2) Install three-way equal percentage Characterized Control valves in a mixing configuration with the “A” port piped to the coil.

3) Install 2½-inch and above, Three-Way globe valves, as manufactured for mixing or diverting service to the coil.

E. Control Damper:
1. Dampers installed in accordance with manufacturer's instructions. Unless specifically designed for vertical blade application, dampers must be mounted with blade axis horizontal.
2. After installation of low-leakage dampers with seals, caulk between frame and duct or opening to prevent leakage around perimeter of damper.

F. Air Flow Station: Install where indicated in ductwork and/or equipment with manufacturer's recommended straight ductwork upstream and downstream of air flow station or as shown on drawings, whichever is greater. Where equipment manufacturer's standard airflow measuring station cannot read airflows at required design velocities, provide appropriate air flow measuring station to provide accurate reading throughout system design operations range.

3.8 SMOKE DETECTION (FOR PROJECTS WITH A FIRE ALARM SYSTEM)

A. Smoke detector furnished and powered/wired under Division 28, Electronic Safety and Security. Coordinate with fire alarm equipment supplier. Installation of duct smoke detector housing and sampling tube under Division 23, HVAC.

B. Install smoke detectors in supply air systems greater than 2000 CFM.

C. Install smoke detectors at each story prior to connection to return air riser in systems greater than 15,000 CFM and serving more than one story.

3.9 SEQUENCES OF OPERATION AND POINTS LISTS

A. Where state and local energy code dictates certain sequences (such as night setback, night flush, pressure and temperature reset, terminal unit sequences, etc.), the sequences are not necessarily repeated in the documents. It is not the intent of this specification or documentation to reiterate the energy code. Provide all energy code mandated sequences and document in sequence of operations submittals at no additional cost to the Owner. Provide all required points to achieve the appropriate sequences.

B. See control diagrams and sequences on drawings where applicable. All Sequence require review and approval of Owner prior to any programming.

C. When any type of air distribution equipment is not in operation, control devices to remain in their "off" positions. "Off" positions may differ from the "normal" (meaning failed) position. Except as specified otherwise, "off" and "normal" positions of control devices to be as follows:

Device	"Off" Position	"Normal" Position
Heating and Chilled Water Coil Valves	closed	open
Outside Air Damper	closed	closed
Return Air Damper	open	open
Exhaust/Relief Air Damper	closed	closed
Fire and Smoke Dampers	closed	open

1. Variable Frequency Drives: For a VFD dependent on an external input for its output setting (e.g., the VFD gets "Frequency" as an input), loss of that external input to result in the VFD holding its last value. If the VFD is running its own PID loop and the external input to the VFD is a setpoint (e.g. duct static pressure setpoint), the VFD to hold the last setpoint. If the VFD loses its process variable (e.g. duct static pressure), the VFD to go to its minimum speed setting.

D. Except as specified otherwise, throttling ranges, proportional bands, and cycle differentials to be centered on the associated setpoint. All modulating feedback control loops to include the capability of having proportional, integral, and derivative action. Unless the loop is specified "proportional only" or "P+I", Contractor to apply appropriate elements of integral and derivative gain to each control loop to result in stable operation, minimum settling time and maintain the primary variable within the specified maximum allowable variance.

E. Provide a real time clock and schedule controller with sufficient scheduling capability to schedule all required controllers and sequences. Schedule functionality may reside in a controller. If a controller is used, document scheduling functionality including names and types on controller points list submittal. Set up initial schedules in coordination with Owner.

F. Scheduling Terminology: When air handlers are scheduled throughout the day, the following defines the terminology used:
   1. Occupied Period: Period of time when the building is in use and occupied. Confirm schedule with Owner. Exclude all national holidays. Generally systems will be fully operational throughout this period and ventilation air to be continuously introduced. Space temperature setpoints will generally be in the "normal" range of 68 degrees to 78 degrees F.
   2. Unoccupied period: Period of time when the building or zone is not in use and unoccupied. Ventilation air not to be introduced.
   3. Preoccupancy Period: Time prior to the Occupied period when the systems are returning the space temperatures from setback to "normal" or occupied setpoints (warm-up and cool-down). Ventilation air shall not be introduced unless outside air conditions permit free-cooling or to support a pre-occupancy purge sequence. Time period to be determined by an optimum start strategy unless otherwise specified.

4. Setback Period: Setback will typically start with the end of the occupied period and end with the start of the preoccupancy period, however it shall be provided with its own schedule. Generally systems will be off except to maintain a "setback" temperature, economization may be enabled to maintain "setback" cooling setpoint when applicable.

G. Where any sequence or occupancy schedule calls for more than one motorized unit to start simultaneously, the BAS start commands to be staggered by 5 second (adj.) intervals to minimize inrush current.

H. Wherever a value is indicated as adjustable (adj.), it shall be modifiable, with the proper password level. For these points, it is unacceptable to have to modify programming statements to change the setpoint.

I. When a power failure is detected in any phase, the BAS start commands to be retracted immediately from all electrically powered units served by the failed power source. If the associated controller is powered by normal or emergency power, it may monitor its own power source as an indication of power status. If the controller is powered by uninterruptible power supply (UPS), or if it is not capable of monitoring its own power for use in sequences, provide at least one voltage monitor (three phase when applicable) per building. When the BAS detects that normal or emergency power has been restored, all equipment for which the BAS start command had been retracted to be automatically restarted in an orderly manner on staggered 5 second intervals to minimize inrush current.

J. Where reset action is specified in a sequence of operation, but a reset schedule is not indicated on the drawings, employ one of the following methods:
   1. Determine a fixed reset schedule to result in stable operation and maintain the primary variable within the specified maximum allowable variance.
   2. Use a floating reset algorithm which increments the secondary variable setpoint (setpoint of control loop being reset) on a periodic basis to maintain primary variable setpoint. The recalculation time and reset increment to be chosen to maintain the primary variable within the specified maximum allowable variance.
   3. Primary variable to control the devices directly using a PID feedback control loop without resetting the secondary variable. However, the control devices to still modulate as necessary to maintain upper and lower limits on the secondary variable. Proportional band, integral gain, and derivative term to be selected to maintain the primary variable within the specified maximum allowable tolerance while minimizing overshoot and settling time. Gain prior approval for implementing this method of reset.

K. Where a supply air temperature or duct pressure setpoint is specified to be reset by the space temperature of the zones calling for the most cooling/heating, emply the following method:
   1. Use a floating reset algorithm which increments the secondary variable (e.g., supply air temperature or duct pressure) setpoint on a periodic basis to maintain

primary variable (e.g., space temperature) setpoint. The reset increment to be determined by the quantity of "need heat" or "need cool" requests from individual SCU's. A SCU's "need heat" virtual point to activate whenever the zone's space temperature falls below the currently applicable (occupied or unoccupied) heating setpoint throttling range. A SCU's "need cool" virtual point to activate whenever the zone's space temperature rises above the currently applicable (occupied, unoccupied, or economy) cooling setpoint throttling range. The recalculation time and reset increment to be chosen to maintain the primary variable within the specified maximum allowable variance while minimizing overshoot and settling time. Reset range maximum and minimum values to limit the setpoint range.

L. Where a supply air temperature, duct pressure, or differential water pressure setpoint is specified to be reset by valve or damper position of the zone or zones calling for the most cooling/heating, the following method to be employed:
   1. A floating reset algorithm to be used which increments the secondary variable (e.g., supply air temperature, pipe or duct pressure) setpoint on a periodic basis to maintain primary variable (e.g., cooling valve, heating valve, damper position) setpoint of 85 percent open. The reset increment to be calculated based on the average position of the quantity of the worst (most open valve/damper) zone(s) as specified. The recalculation time, reset increment and control device position influence to be chosen to maintain the primal variable within the specified maximum allowable variance while overshoot and settling time. The BAS analog output value to be acceptable as indicating the position of the control device.
   2. Alternatively to continuously calculating the average of the quantity of worst valve/damper positions, a method similar to the one described above may be employed whereby the "need heat" or "need cool" virtual point to increment by one unit each time a zone's valve/damper position rises to greater than 95 percent. The quantity of "need heat" or "need cool" points to then be the basis for reset.

M. Where "prove operation" of a device (generally controlled by a digital output) is indicated in the sequence, it shall require that the BAS, after an adjustable time delay after the device is commanded to operate (feedback delay), confirm that the device is operational via the status input. If the status point does not confirm operation after the time delay or anytime thereafter for an adjustable time delay (debounce delay) while the device is commanded to run, an alarm to be enunciated audibly. Upon failure, run command to be removed and the device to be locked out until the alarm is manually acknowledged unless specified otherwise.

N. BAS to provide for adjustable maximum rates of change for increasing and decreasing output from the following analog output points:
   1. Speed control of variable speed drives
   2. Control Reset Loop
   3. Valve Travel Limit

O. Wherever a value is indicated to be dependent on another value (i.e., setpoint plus 5 degrees F) BAS to use that equation to determine the value. Simply providing a virtual

point that the operator must set is unacceptable. In this case three virtual points to be provided. One to store the parameter (5 degrees F), one to store the setpoint, and one to store the value which is the result of the equation.

P. Trend points as identified in the points list. Trends to be grouped system specific and setup in two-axis (x,y) graphical format that display object values relative to time. Setup trends to record data in 5 minute increments.

END OF SECTION 23 09 00

SECTION 23 31 13

METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Materials.
   2. Duct cleaning.
   3. Hangers and Supports

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following products:
   1. Liners and adhesives.
   2. Sealants and gaskets.
   3. Seismic-restraint devices.

B. LEED Submittals:
   1. Product Data for Prerequisite IEQ 1: Documentation indicating that duct systems comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."
   2. Product Data for Prerequisite EA 2: Documentation indicating that duct systems comply with ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."
   3. Leakage Test Report for Prerequisite EA 2: Documentation of work performed for compliance with ASHRAE/IESNA 90.1, Section 6.4.4.2.2 - "Duct Leakage Tests."

4. Duct-Cleaning Test Report for Prerequisite IEQ 1: Documentation of work performed for compliance with ASHRAE 62.1, Section 7.2.4 - "Ventilation System Start-up."
5. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content.

C. Shop Drawings:
1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

D. Delegated-Design Submittal:
1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.
5. Design Calculations: Calculations, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation for selecting hangers and supports and seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.

6. Items penetrating finished ceiling including the following:
   a. Lighting fixtures.
   b. Air outlets and inlets.
   c. Speakers.
   d. Sprinklers.
   e. Access panels.
   f. Perimeter moldings.

B. Welding certificates.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
   2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
   3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

1.6 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

C. Ductwork shall be transported to the site in enclosed vehicles or with ends capped with Visqueen or foam caps.

D. Do not store ductwork directly on ground or floor.

E. Ductwork stored or stacked on site shall be capped.

F. Installed duct shall be capped at the end of the day. Duct found uncapped shall be cleaned.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
   1. Ducts shall have mill-phosphatized finish for surfaces exposed to view

B. Flexible Ducts:
   1. UL Labeled, black polymer film supported by helically wound spring steel wire.
      a. Pressure Rating: 4 inches WG positive and 0.5 inches WG negative.
      b. Maximum Velocity: 4000 fpm.
      c. Temperature Range: -20 degrees F to 175 degrees F.

C. Aluminum for Ducts: ASTM B209 (ASTM B209M); aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T651 or of equivalent strength.

D. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
   1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
   2. VOC Content: Not more than 250 g/L, excluding water.
   3. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E84.
   4. For Use With Flexible Ducts: UL labeled.
   5. Products:
      a. Carlisle HVAC Products; Hardcast Iron-Grip 601 Water Based Duct Sealant: www.carlislehvac.com.
      b. Substitutions: See Section 01 62 00 – Product Options and Substitutions.

E. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

F. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
   1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
   2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
   3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
   4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
   5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
   6. Other Types: As required.

2.2 HANGERS AND SUPPORTS

A. Verify all duct and hanger attachments with structural engineer.

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
   1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
   2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Materials: Galvanized sheet steel or threaded steel rod.

D. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

E. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.

F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

G. Trapeze and Riser Supports: Galvanized-steel shapes and plates complying with ASTM A 36/A 36M.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA 1966.

B. Install in accordance with manufacturer's instructions.

C. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, and as indicated.

D. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE Handbook Fundamentals

E. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

F. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.

G. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

H. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

I. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

J. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

K. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of nonbraced panel area unless ducts are lined.

L. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

M. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

N. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.

O. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.

P. Electrical Equipment Spaces: Route ducts to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

Q. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

R. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

S. Install ducts with fewest possible joints.

T. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches, with a minimum of 3 screws in each coupling.

U. Use double nuts and lock washers on threaded rod supports.

V. Make connections to equipment with flexible connectors according to Division 23 Section "Duct Accessories."

W. Connect diffusers or light troffer boots to low pressure ducts with 5 feet maximum length of flexible duct held in place with strap or clamp.

X. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2 inches.

Y. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, sleeves, and firestopping sealant. Fire and smoke dampers are specified in Division 23 Section "Duct Accessories." Firestopping materials and installation methods are specified in Division 7 Section "Through-Penetration Firestop Systems."

Z. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction."

AA. Protect ductwork during construction against entry of foreign matter and construction dirt.

BB. Keep ductwork capped when work is complete for the day or when the certain main or trunk line is not being worked on or added to. The use of polyvinyl with ductape wrap is an adequate measure as long as it is secure with no openings or tears in the product.

CC. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

DD. Seal ducts before external insulation is applied.

EE. Stainless steel exhaust ductwork: Joints to be continuously welded.

3.2 HANGER AND SUPPORT INSTALLATION

A. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.

B. Support vertical ducts at maximum intervals of 16 feet and at each floor.

C. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

D. Install concrete inserts before placing concrete.

3.3 DUCT CLEANING

A. Clean new and existing duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.
   1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 23 33 00 "Air Duct Accessories" for access panels and doors.
   2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
   3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:
   1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
   2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:
   1. Air outlets and inlets (registers, grilles, and diffusers).
   2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
   3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
   4. Coils and related components.
   5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
   6. Supply-air ducts, dampers, actuators, and turning vanes.
   7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:
   1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
   2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
   3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
   4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
   5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
   6. Provide drainage and cleanup for wash-down procedures.

7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.4 DUCT AIR LEAKAGE TEST

A. Risers and all supply and exhaust branch ducting shall be tested to within 5 feet of a diffuser collar or the point of connection to an exhaust device, respectively. Perform the following field tests and inspections according to SMACNA's "HVAC Air Duct Leakage Test Manual" and prepare test reports:
   1. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
   2. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.
   3. Maximum Allowable Leakage: Comply with requirements for Leakage Class 3 for round and flat-oval ducts, Leakage Class 12 for rectangular ducts in pressure classes lower than and equal to 2-inch wg (both positive and negative pressures), and Leakage Class 6 for pressure classes from 2- to 10-inch wg.
   4. Remake leaking joints and retest until leakage is equal to or less than maximum allowable.

3.5 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

B. Supply Ducts:
   1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal :
      a. Pressure Class: Positive 2-inch wg (500 Pa).
   2. Ducts Connected to Variable-Air-Volume Air-Handling Units:
      a. Pressure Class: Positive 3-inch wg (750 Pa).

C. Return Ducts:
   1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units :
      a. Pressure Class: Positive or negative 2-inch wg (500 Pa).

D. Exhaust Ducts:
   1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
      a. Pressure Class: Negative 2-inch wg (500 Pa).

E. Intermediate Reinforcement:
   1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.
   2. Stainless-Steel Ducts:
      a. Exposed to Airstream: Match duct material.

b. Not Exposed to Airstream: Match duct material.

F. Liner:
1. Supply Air Ducts: Flexible elastomeric, 1 inch (25 mm) thick.
2. Return Air Ducts: Flexible elastomeric thick.
3. Supply Fan Plenums: Flexible elastomeric, 1 inch (25 mm) thick.
4. Return Fan Plenums: Flexible elastomeric, 1 inches (51 mm) thick.
5. Transfer Ducts: Flexible elastomeric, 1 inch (25 mm) thick.

G. Elbow Configuration:
1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
   a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
   b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
   c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
   a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
   b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
   c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Standing seam and/or Welded.

H. Branch Configuration:
1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
   a. Rectangular Main to Rectangular Branch: 45-degree entry.
   b. Rectangular Main to Round Branch: Spin in.
2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
   a. Velocity 1000 fpm (5 m/s) or Lower: 90-degree tap.
   b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s): Conical tap.
   c. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

END OF SECTION 23 31 13

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Backdraft and pressure relief dampers.
2. Barometric relief dampers.
3. Manual volume dampers.
4. Control dampers.
5. Combination fire and smoke dampers.
6. Flange connectors.
7. Duct silencers.
8. Turning vanes.
9. Duct-mounted access doors.
10. Flexible connectors.
11. Flexible ducts.
12. Duct accessory hardware.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings. Submit laboratory acoustic and aerodynamic performance obtained according to ASTM E477-13. The laboratory must be currently NVLAP accredited for the ASTM E477-13 test standard. A copy of the accreditation certificate must be included with the submittals. Data from non-NVLAP accredited test facilities will not be accepted. Shop drawings submitted without proper certifications will be rejected.

B. LEED Submittals:
1. Product Data for Prerequisite IEQ 1: Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."
2. Product Data for Prerequisite EA 2: Documentation indicating that duct insulation R-values comply with tables in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air Conditioning."

C. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
a. Special fittings.
b. Manual volume damper installations.

c. Control-damper installations.
d. Fire-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors.
e. Wiring Diagrams: For power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

B. Source quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
1. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

B. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

C. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

D. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Description: Gravity balanced, rattle-free.

B. Maximum System Pressure: 2-inch wg.

C. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel, with welded corners or mechanically attached.

D. Blades: Multiple single-piece blades, center pivoted, maximum 6-inch width, 0.050-inch-thick aluminum sheet with sealed edges.

E. Blade Action: Parallel.

F. Blade Seals: Extruded vinyl, mechanically locked.

G. Blade Axles:
1. Material: Plated steel.
2. Diameter: 0.20 inch.

H. Return Spring: Adjustable tension.

I. Accessories:
1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.
4. Chain pulls.
5. Screen Mounting: Front mounted in sleeve.
   a. Sleeve Thickness: 20 gage minimum.
   b. Sleeve Length: 6 inches minimum.
6. Screen Mounting: Rear mounted.
7. Screen Material: Aluminum.
8. Screen Type: Bird.
9. 90-degree stops.

2.4 BAROMETRIC RELIEF DAMPERS

A. Suitable for horizontal or vertical mounting.

B. Maximum System Pressure: 2-inch wg.

C. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel, with welded corners or mechanically attached.

D. Blades:
   1. Multiple, 0.050-inch-thick aluminum sheet.
   2. Maximum Width: 6 inches.
   3. Action: Parallel.
   4. Balance: Gravity.

E. Blade Seals: Vinyl.

F. Blade Axles: Plated steel.

G. Return Spring: Adjustable tension.

H. Accessories:
   1. Flange on intake.
   2. Adjustment device to permit setting for varying differential static pressures.

2.5 MANUAL VOLUME DAMPERS

A. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

B. Standard, Steel, Manual Volume Dampers:
   1. Standard leakage rating.
   2. Suitable for horizontal or vertical applications.
   3. Frames:
      a. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel.
      b. Mitered and welded corners.
      c. Flanges for attaching to walls and flangeless frames for installing in ducts.
   4. Blades:
      a. Multiple or single blade.
      b. Parallel- or opposed-blade design.
      c. Stiffen damper blades for stability.
      d. Galvanized-steel, 0.064 inch thick.
   5. Blade Axles: Galvanized steel.
   6. Bearings:
      a. Molded synthetic.
      b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
   7. Tie Bars and Brackets: Galvanized steel.

C. Standard, Aluminum, Manual Volume Dampers:
   1. Standard leakage rating.
   2. Suitable for horizontal or vertical applications.
   3. Frames: Hat-shaped, 0.10-inch-thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.

4. Blades:
   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Stiffen damper blades for stability.
   d. Roll-Formed Aluminum Blades: 0.10-inch-thick aluminum sheet.
   e. Extruded-Aluminum Blades: 0.050-inch-thick extruded aluminum.
5. Blade Axles: Nonferrous metal.
6. Bearings:
   a. Molded synthetic.
   b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
7. Tie Bars and Brackets: Aluminum.

D. Damper Hardware:
1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.6 CONTROL DAMPERS

A. Low-leakage rating and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.

B. Frames:
1. Hat shaped.
2. 0.094-inch-thick, galvanized sheet steel.
3. Mitered and welded corners.

C. Blades:
1. Multiple blade with maximum blade width of 6 inches.
2. Parallel- or opposed-blade design as required.
3. Galvanized-steel.
4. Blade Edging: Closed-cell neoprene.
5. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

D. Blade Axles: 1/2-inch-diameter; plated steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.
1. Operating Temperature Range: From minus 40 to plus 200 deg F.

E. Bearings:
1. Stainless-steel sleeve.
2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.7 COMBINATION FIRE AND SMOKE DAMPERS

A. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.

B. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.

C. Fire smoke dampers shall have a minimum Class II leakage rating.

D. Fire Rating: as required.

E. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel, with interlocking, gusseted corners.

F. Heat-Responsive Device: Electric resettable device and switch package, factory installed, rated.

G. Smoke Detector: Integral, factory wired for single-point connection.

H. Rated pressure and velocity to exceed design airflow conditions.

I. Mounting Sleeve: Factory-installed, 0.05-inch- thick, galvanized sheet steel; length to suit wall or floor application.

J. Master control panel for use in dynamic smoke-management systems.

K. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."
   1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
   2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Section 23 09 23 "Direct Digital Control (DDC) System for HVAC."
   3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
   4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
   5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
   6. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.
   7. Electrical Connection: 115 V, single phase, 60 Hz.

L. Accessories:
   1. Auxiliary switches for signaling position indication.
   2. Test and reset switches, remote mounted.

2.8 FLANGE CONNECTORS

A. Description: roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

B. Material: Galvanized steel.

C. Gage and Shape: Match connecting ductwork.

2.9 DUCT SILENCERS

A. General Requirements:
   1. Factory fabricated.
   2. Fire-Performance Characteristics: Adhesives, sealants, packing materials, and accessory materials shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84.
   3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
   4. All casing seams and joints shall be lock-formed and sealed or stitch welded and sealed to provide leakage-resistant construction. Airtight construction shall be achieved by use of a duct-sealing compound supplied and installed by the contractor at the jobsite.

B. Manufacturers:
   1. Vibro-Acoustics
   2. Ruskin
   3. Kinetics Noise Control

C. Connection Sizes: Match connecting ductwork unless otherwise indicated.

D. Source Quality Control: Test according to ASTM E 477.

2.10 TURNING VANES

A. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
   1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

B. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

D. Vane Construction: Double wall.

2.11 DUCT-MOUNTED ACCESS DOORS

A. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."
   1. Door:
      a. Double wall, rectangular.
      b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
      c. Vision panel.
      d. Hinges and Latches: 1-by-1-inchbutt or piano hinge and cam latches.
      e. Fabricate doors airtight and suitable for duct pressure class.
   2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
   3. Number of Hinges and Locks:
      a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
      b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
      c. Access Doors larger than 18 Inches Square: Continuous and two compression latches.

2.12 FLEXIBLE CONNECTORS

A. Manufacturers:
   1. Ductmate Industries, Inc.
   2. Flexmaster U.S.A., Inc.
   3. Hart & Cooley, Inc.
   4. McGill AirFlow Corporation.

B. Duct Connectors: UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound, spring-steel wire.
   1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
   2. Maximum Air Velocity: 4000 fpm.
   3. Temperature Range: Minus 20 to plus 210 deg F.
   4. Maximum Installed Length: 14 inches.

C. Flexible Duct Clamps: Nylon or stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action.

D. Materials: Flame-retardant or noncombustible fabrics.

E. Coatings and Adhesives: Comply with UL 181, Class 1.

F. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
   1. Minimum Weight: 26 oz./sq. yd..
   2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
   3. Service Temperature: Minus 40 to plus 200 deg F.

G. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
   1. Minimum Weight: 24 oz./sq. yd..
   2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
   3. Service Temperature: Minus 50 to plus 250 deg F.

2.13 FLEXIBLE DUCTS

A. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
   1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
   2. Maximum Air Velocity: 4000 fpm.
   3. Temperature Range: Minus 10 to plus 160 deg F.
   4. Insulation R-value: Comply with ASHRAE/IESNA 90.1 or Title 24, whichever is most stringent.

B. Flexible Duct Connectors:
   1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action or Nylon strap in sizes 3 through 18 inches, to suit duct size.
   2. Non-Clamp Connectors: Liquid adhesive plus tape.

2.14 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
   1. Install steel volume dampers in steel ducts.
   2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire and smoke dampers according to UL listing.

H. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, turning vanes and elsewhere as indicated. Provide duct access doors t Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

I. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

J. Install access doors with swing against duct static pressure.

K. Label access doors according to Section 23 05 53 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

L. Install fire dampers, with fusible links, according to manufacturer’s UL-approved written instructions.

M. Install flexible connectors to connect ducts to equipment.

N. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Operate dampers to verify full range of movement.
   2. Inspect locations of access doors and verify that purpose of access door can be performed.

3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 23 33 00

SECTION 23 34 00

FANS AND VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
   1. The ceiling-mounted circulation fans as scheduled with the capacities indicated. The fan shall be furnished with standard mounting hardware, wall mounted variable speed control to provide cooling, destratification and occupancy control.

B. Summary of Work
   1. Installation of the fan, wireless network, miscellaneous or structural metal work (if required), field electrical wiring, cable, conduit, fuses and disconnect switches, other than those addressed in the installation scope of work, shall be provided by others. Consult the appropriate installation scope of work for information on the available installation options, overview of customer and installer responsibilities, and details on installation site requirements.

1.2 REFERENCES

A. International Organization for Standardization (ISO)

B. National Electric Code (NEC)

C. National Fire Protection Association (NFPA)

D. Underwriters Laboratory (UL)

1.3 SUBMITTALS

A. Shop Drawings: Drawings detailing product dimensions, weight, and attachment methods

B. Part 2 Product Data: Specification sheets on the ceiling−mounted fan, specifying electrical and installation requirements, features and benefits, and controller information.

C. Revit Files: Files provided for architectural design.

D. Part 2 Product Documentation: The manufacturer shall furnish a copy of all installation, operation, and maintenance instructions for the fan.

E. Schedule.

1.4 QUALITY ASSURANCE

A. Certifications
   1. Safety
      a. The fan assembly, as a system, shall be ETL−certified and built pursuant to the following standards.
         1) United States
            a) UL 507. Standard for Safety for Electric Fans.
      b. The fan motor shall be ETL−certified and built pursuant to the following standards
         1) United States
            a) UL 1004−1. Standard for Safety for Rotating Electrical Machines − Part 1 General Requirements.
            b) UL 1004−3. Standard for Safety for Thermally Protected Motors.
            c) UL 1004−7. Standard for Safety for Electronically Protected Motors.
   2. Sustainability Certification
      a. Forest Stewardship Council (FSC) certification
      b. ENERGY STAR® certification − ENERGY STAR Most Efficient 2015

B. Manufacturer Qualifications
   1. ISO 9001−certified

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver product in original, undamaged packaging with identification labels intact. The fan shall be new, free from defects, and factory tested.

B. The fan and its components must be stored in a safe, dry location until installation.

1.6 WARRANTY

A. The manufacturer shall replace any products or components defective in material or workmanship, free of charge to the customer (including transportation charges within the USA), pursuant to the complete terms and conditions of the warranty in accordance to the following schedule:

B. Industrial and Commercial Installations
   1. Item Period of Coverage
   2. Motor 2 years
   3. All other components 1 year

PART 2 - PRODUCT

2.1 MANUFACTURER

A. Big Ass Fans: www.bigassfans.com.

B. Substitutions are to be approved by Architect.

2.2 HIGH VOLUME, LOW SPEED FANS

A. Complete Unit
   1. Regulatory Requirements: The entire fan assembly shall be TUV−certified and built pursuant to the construction guidelines set forth by UL standard 507 and CSA standard 22.2. No. 113.
   2. Sustainability Characteristics: The fan shall be designed to move an effective amount of air for cooling and destratification of conditioned commercial applications over an extended life. The fan components shall be designed specifically for high volume, low speed fans to ensure lower operational noise. Sound levels from the fan operating at maximum speed measured in a laboratory setting shall not exceed 40 dBA. Actual results of sound measurements in the field may vary due to sound reflective surfaces and environmental conditions.
   3. Good workmanship shall be evident in all aspects of construction. Field balancing of the airfoils shall not be necessary.

B. Controls
   1. The fan controller shall be incorporated into the fan assembly and housed in an enclosure independent of the motor to prevent overheating or electrical interference. The fan controller shall be factory programmed to minimize starting and braking torques and shall be equipped with a simple diagnostic program and an LED light to identify and relay faults in the system.

C. Airfoil System
   1. The fan shall be equipped with eight (8) high volume, low speed airfoils of precision extruded, anodized aluminum alloy. The airfoils shall be connected to the hub and interlocked with eight (8) stainless steel retainers and two (2) sets of stainless steel bolts and lock washers per airfoil.
   2. The fan shall be equipped with eight (8) upswept winglets designed to redirect outward airflow downward, thereby enhancing efficiency. The winglets shall be molded of high strength polymer and shall be attached at the tip of each airfoil with a stainless steel screw. The standard color of the winglets shall be silver or black.
   3. As an option, the fan shall be equipped with eight (8) plug−style airfoil tips, molded of high strength polymer, in place of the eight (8) upswept winglets. The airfoil tips shall be attached at the tip of each airfoil with a stainless steel screw. The standard color of the airfoil tips shall be black.

D. Motor
   1. The fan motor shall be a permanent magnet brushless motor rated for continuous operation at maximum speed with the capability of modulating the fan speed from 0−100% without the use of a gearbox or other mechanical means of control. The motor shall operate from any voltage ranging from 100−120 VAC or 200−240 VAC, single phase, and 60Hz, without requiring adapters or customer selection.

The motor shall be a non−ventilated, heat sink design with the capability of continuous operation in −13˚F to 131˚F ambient condition. The standard color of the motor unit shall be white with silver trim or silver with black trim.

2. The motor shall be rated at one of the following:
   a. 8−ft fan average power @ max speed = 475 Watts
   b. 10−ft fan average power @ max speed = 425 Watts
   c. 12−ft fan average power @ max speed = 350 Watts
   d. 14−ft fan average power @ max speed = 300 Watts

E. Mounting System
   1. The fan mounting system shall be designed for quick and secure installation from a variety of structural supports. All components in the mounting system shall be of formed metal design using low−carbon steel no less than 3/16" thick and containing no critical welds. The mounting system shall be powder coated for appearance and resistance to corrosion. All mounting bolts shall be metric stainless steel or equivalent. No mounting hardware substitutions, including cast aluminum, are acceptable.

F. Hub
   1. The fan hub shall be constructed of zinc plated steel for high strength and durability. The hub shall be precision machined to achieve a well−balanced and solid rotating assembly.

G. Safety Cable
   1. The fan shall be equipped with a safety cable that provides an additional means of securing the fan assembly to the building structure. The safety cable shall be Ø3/16" diameter and fabricated out of 7 x 19 stranded galvanized steel, pre−loaded and tested to 3,200 lbf.
   2. Field construction of safety cables is not permitted.

H. Wall Control
   1. Wired. The fan shall be equipped with a low−voltage wired remote wall control providing control of all fan functions. The wall control shall be capable of mounting to a standard electrical box or directly to a wall surface. The wall control shall include a rotary−style dial for controlling the fan's power and speed and an LED light to identify and relay faults in the system. Communication with the fan drive and controller shall be by a standard, commercially available CAT5 (or higher) Ethernet cable that is field installed and provided by the installer.

I. Fire Control Panel Integration
   1. Includes a 10−30 VDC pilot relay for seamless fire control panel integration. The pilot relay can be wired Normally Open or Normally Closed in the field.

J. Guy Wires
   1. Guy wires shall be included for installations with extension tubes 4 ft or longer to limit the potential for lateral movement.

PART 3 - EXECUTION

3.1 PREPARATION

A. Fan location must have a typical bar joist or existing I−beam structure from which to mount the fan. Additional mounting options may be available. Consult the installation guide for additional details.

B. Mounting structure must be able to support weight and operational torque of fan, as per structural details.

C. The fan location must be free from obstacles such as lights, cables, or other building components.

D. Check the fan location for proper electrical requirements. Consult the installation guide for appropriate circuit requirements.

3.2 INSTALLATION

A. The fan shall be installed by a factory−certified installer according to the manufacturer's Installation Guide, which includes acceptable structural dimensions and proper sizing and placement of angle irons for bar joist applications.

B. A structural engineer shall be consulted for installation methods outside the manufacturer's recommendation and a certification, in the form of a stamped print or letter, submitted prior to installation.

C. Required Distances for Essence model
   1. Airfoils must be at least 10 ft above the floor.
   2. Installation area must be free of obstructions such as lights, cables, sprinklers, or other building structures with the airfoils at least 2 ft clear of all obstructions.
   3. The structure the fan is attached to shall be capable of supporting a torque load of up to 40 ft·lb of torque.

D. In buildings equipped with sprinklers, fan installation shall comply with all of the following:
   1. The maximum fan diameter shall be 24 ft.
   2. The fan shall be centered approximately between four adjacent sprinklers.
   3. The vertical clearance from the fan to the sprinkler deflector shall be a minimum of 3 ft.
   4. All fans shall be interlocked to shut down immediately upon receiving a waterflow signal from the alarm system in accordance with the requirements of NFPA 72—National Fire Alarm and Signaling Code.

END OF SECTION 23 34 00

SECTION 23 34 16

CENTRIFUGAL HVAC FANS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: For each product.
   1. Backward-inclined centrifugal fans.
   2. Forward-curved centrifugal fans.

1.2 ACTION SUBMITTALS

A. Product Data:
   1. Include rated capacities, furnished specialties, and accessories for each fan.
   2. Certified fan performance curves with system operating conditions indicated.
   3. Certified fan sound-power ratings.
   4. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   5. Material thickness and finishes, including color charts.
   6. Dampers, including housings, linkages, and operators.

B. Shop Drawings:
   1. Include plans, elevations, sections, and attachment details.
   2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include diagrams for power, signal, and control wiring.
   4. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
   5. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show fan room layout and relationships between components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate and certify field measurements.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For centrifugal fans to include in emergency, operation, and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Belts: One set for each belt-driven unit.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AMCA Compliance:
   1. Comply with AMCA performance requirements and bear the AMCA-Certified Ratings Seal.
   2. Operating Limits: Classify according to AMCA 99.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Capacities and Characteristics:
   1. Housing Material: Galvanized steel.
   2. Wheel Material: Steel.
   3. Motor:
      a. Motor Enclosure: Open, dripproof.
      b. Efficiency: Premium efficient.

D. Fans used by life safety systems shall be UL 705 rated power ventilators.

2.2 BACKWARD-INCLINED CENTRIFUGAL FANS

A. Manufacturers: Subject to compliance with requirements, provide product by:
   1. Greenheck Fan Corporation.

B. Description:
   1. Factory-fabricated, -assembled, -tested, and -finished, belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, and support structure.
   2. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations.
   3. Factory-installed and -wired disconnect switch.

C. Housings:
   1. Formed panels to make curved-scroll housings with shaped cutoff.
   2. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.
   3. Horizontally split, bolted-flange housing.
   4. Spun inlet cone with flange.
   5. Outlet flange.

D. Backward-Inclined Wheels:
   1. Single-width-single-inlet and double-width-double-inlet construction with curved inlet flange, backplate, backward-inclined blades, and fastened to shaft with set screws.
   2. Welded or riveted to flange and backplate; cast-iron or cast-steel hub riveted to backplate.

E. Shafts:
   1. Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with adjustable alignment and belt tensioning.
   2. Turned, ground, and polished hot-rolled steel with keyway. Ship with protective coating of lubricating oil.
   3. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

F. Grease-Lubricated Shaft Bearings:
   1. Self-aligning, pillow-block-type.
   2. Ball-Bearing Rating Life: ABMA 9, Ll0 at 100,000 hours.
   3. Roller-Bearing Rating Life: ABMA 11, Ll0 at 100,000 hours.

G. Belt Drives:
   1. Factory mounted, with adjustable alignment and belt tensioning.
   2. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
   3. Motor Pulleys: Adjustable pitch for use with motors through [**5**] hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
   4. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
   5. Belt Guards: Fabricate to comply with OSHA and SMACNA requirements of diamond-mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation. Include provisions for adjustment of belt tension, lubrication, and use of tachometer with guard in place.
   6. Motor Mount: Adjustable for belt tensioning.

H. Accessories:
   1. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.
   2. Scroll Drain Connection: NPS 1 (DN 25) steel pipe coupling welded to low point of fan scroll.
   3. Companion Flanges: Rolled flanges for duct connections of same material as housing.

4. Variable Inlet Vanes: With blades supported at both ends with two permanently lubricated bearings of same material as housing. Variable mechanism terminating in single control lever with control shaft for double-width fans.
5. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft.
6. Spark-Resistant Construction: AMCA 99.
7. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.
8. Weather Cover: Enameled-steel sheet with ventilation slots, bolted to housing.

2.3 FORWARD-CURVED CENTRIFUGAL FANS

A. Manufacturers: Subject to compliance with requirements, provide product by:
   1. Greenheck Fan Corporation.

B. Description:
   1. Factory-fabricated, -assembled, -tested, and -finished, belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, and support structure.
   2. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations.
   3. Factory-installed and -wired disconnect switch.

C. Housings:
   1. Formed panels to make curved-scroll housings with shaped cutoff.
   2. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.
   3. Split housings in first subparagraph below are an optional configuration.
   4. Spun inlet cone with flange.
   5. Outlet flange.

D. Forward-Curved Wheels:
   1. Black-enameled or galvanized-steel construction with inlet flange, backplate, shallow blades with inlet and tip curved forward in direction of airflow.
   2. Mechanically secured to flange and backplate; cast-steel hub swaged to backplate and fastened to shaft with set screws.

E. Shafts:
   1. Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with adjustable alignment and belt tensioning.
   2. Turned, ground, and polished hot-rolled steel with keyway. Ship with protective coating of lubricating oil.
   3. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

F. Grease-Lubricated Shaft Bearings:
   1. Self-aligning, pillow-block-type.
   2. Ball-Bearing Rating Life: ABMA 9, Ll0 at 100,000 hours.
   3. Roller-Bearing Rating Life: ABMA 11, Ll0 at 100,000 hours.

G. Belt Drives:
   1. Factory mounted, with adjustable alignment and belt tensioning.
   2. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
   3. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
   4. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
   5. Belt Guards: Fabricate to comply with OSHA and SMACNA requirements of diamond-mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation. Include provisions for adjustment of belt tension, lubrication, and use of tachometer with guard in place.
   6. Motor Mount: Adjustable for belt tensioning.

H. Accessories:
   1. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.
   2. Scroll Drain Connection: NPS 1 (DN 25) steel pipe coupling welded to low point of fan scroll.
   3. Companion Flanges: Rolled flanges for duct connections of same material as housing.
   4. Variable Inlet Vanes: With blades supported at both ends with two permanently lubricated bearings of same material as housing. Variable mechanism terminating in single control lever with control shaft for double-width fans.
   5. Inlet Screens: Grid screen of same material as housing.
   6. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft.
   7. Spark-Resistant Construction: AMCA 99.
   8. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.
   9. Weather Cover: Enameled-steel sheet with ventilation slots, bolted to housing.

2.4 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."

2.5 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210/ASHRAE 51, "Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install centrifugal fans level and plumb.

B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

D. Equipment Mounting:
   1. Install centrifugal fans on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified.
   2. Comply with requirements for vibration isolation and seismic control devices specified in Section 23 05 48 "Vibration and Seismic Controls for HVAC."
   3. Comply with requirements for vibration isolation devices specified in Section 23 05 48.13 "Vibration Controls for HVAC."

E. Unit Support: Install centrifugal fans level on structural curbs. Coordinate wall penetrations and flashing with wall construction. Secure units to structural support with anchor bolts.

F. Install units with clearances for service and maintenance.

G. Label fans according to requirements specified in Section 23 05 53 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 23 33 00 "Air Duct Accessories."

B. Install ducts adjacent to fans to allow service and maintenance.

C. Install piping from scroll drain connection, with trap with seal equal to 1.5 times specified static pressure, to nearest floor drain with pipe sizes matching the drain connection.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections:
1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. See Section 23 05 93 "Testing, Adjusting, and Balancing For HVAC" for testing, adjusting, and balancing procedures.
10. Remove and replace malfunctioning units and retest as specified above.

D. Test and adjust controls and safeties. Controls and equipment will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain centrifugal fans.

END OF SECTION 23 34 16

SECTION 23 36 00

AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Shutoff, single-duct air terminal units.
   2. Casing liner.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of air terminal unit.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for air terminal units.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. LEED Submittals:
   1. Product Data for Prerequisite IEQ 1: Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."
   2. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content.

C. Shop Drawings: For air terminal units.
   1. Include plans, elevations, sections, and mounting details.
   2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include diagrams for power, signal, and control wiring.
   4. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

D. Delegated-Design Submittal:
   1. Materials, fabrication, assembly, and spacing of hangers and supports.
   2. Include design calculations, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation for selecting hangers and supports and seismic restraints.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Ceiling suspension assembly members.

2. Size and location of initial access modules for acoustic tile.
3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals.
1. In addition to items specified in Division 01:
a. Instructions for resetting minimum and maximum air volumes.
b. Instructions for adjusting software set points.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

C. ASHRAE Compliance: Applicable requirements in ASHRAE/IES 90.1, "Section 6 - Heating, Ventilating, and Air Conditioning."

2.2 SHUTOFF, SINGLE-DUCT AIR TERMINAL UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Krueger.
2. Price Industries.
3. Titus.

B. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.
1. Casing Liner: Comply with requirements in "Casing Liner" Article for flexible elastomeric duct liner.
2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
3. Air Outlet: S-slip and drive connections, size matching inlet size.
4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

C. Regulator Assembly: System-air-powered bellows section incorporating polypropylene bellows for volume regulation and thermostatic control. Bellows shall operate at temperatures from zero to 140 deg F, shall be impervious to moisture and fungus, shall be suitable for 10-inch wg static pressure, and shall be factory tested for leaks.

D. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.
   1. Maximum Damper Leakage: AHRI 880 rated, 2 percent of nominal airflow at 3-inch wg inlet static pressure.
   2. Damper Position: Normally open.

E. Attenuator Section: [0.032-inch aluminum] sheet.
   1. Attenuator Section Liner: Comply with requirements in "Casing Liner" Article for flexible elastomeric duct liner.
   2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

F. Hydronic Heating Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve.
   1. Access door interlocked disconnect switch.
   2. Downstream air temperature sensor with local connection to override discharge-air temperature to not exceed a maximum temperature set point (adjustable).
   3. Electronic Thermostat: Wall-mounted electronic type with temperature set-point display in Fahrenheit and Celsius.
   4. Electronic Velocity Controller: Factory calibrated and field adjustable to minimum and maximum air volumes; shall maintain constant airflow dictated by thermostat within 5 percent of set point while compensating for inlet static-pressure variations up to 4-inch wg; and shall have a multipoint velocity sensor at air inlet.
   5. Terminal Unit Controller: Pressure-independent, variable-air-volume (VAV) controller with electronic airflow transducer with multipoint velocity sensor at air inlet, factory calibrated to minimum and maximum air volumes, and having the following features:
      a. Occupied and unoccupied operating mode.
      b. Remote reset of airflow or temperature set points.
      c. Adjusting and monitoring with portable terminal.
      d. Communication with temperature-control system specified in Section 23 09 23 "Direct Digital Control (DDC) System for HVAC."
   6. Room Sensor: Wall mounted with temperature set-point adjustment and access for connection of portable operator terminal.

2.3 CASING LINER

A. Casing Liner: Flexible elastomeric duct liner fabricated of preformed, cellular, closed-cell, sheet materials complying with ASTM C 534, Type II, Grade 1; and with NFPA 90A or NFPA 90B.
   1. Minimum Thickness: 3/4 inch.
   2. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
   3. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
      a. Adhesive VOC Content: 50 g/L or less.
      b. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.4 SOURCE QUALITY CONTROL

A. Factory Tests: Test assembled air terminal units according to AHRI 880.
   1. Label each air terminal unit with plan number, nominal airflow, maximum and minimum factory-set airflows, coil type, and AHRI certification seal.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 5, "Hangers and Supports" and with Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
   1. Where practical, install concrete inserts before placing concrete.
   2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
   3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes and for slabs more than 4 inches thick.
   4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes and for slabs less than 4 inches thick.
   5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hangers Exposed to View: Threaded rod and angle or channel supports.

D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.2 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. Install hangers and braces designed to support the air terminal units and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems." Comply with requirements for seismic-restraint devices in Section 23 05 48 "Vibration and Seismic Controls for HVAC."

B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install cable restraints on air terminal units that are suspended with vibration isolators.

E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction.

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.

G. Drilling for and Setting Anchors:
   1. Identify position of reinforcing steel and other embedded items before drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
   2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
   3. Wedge Anchors: Protect threads from damage during anchor installation. Install heavy-duty sleeve anchors with sleeve fully engaged in the structural element to which anchor is to be fastened.
   4. Set anchors to manufacturer's recommended torque, using a torque wrench.
   5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.3 TERMINAL UNIT INSTALLATION

A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

3.4 CONNECTIONS

A. Where installing piping adjacent to air terminal unit, allow space for service and maintenance.

B. Hot-Water Piping: Comply with requirements in Section 23 21 13 "Hydronic Piping" and Section 23 21 16 “Hydronic Piping Specialties" and connect heating coils to supply with shutoff valve, strainer, control valve, and union or flange; and to return with balancing valve and union or flange.

C. Comply with requirements in Section 23 31 13 "Metal Ducts" for connecting ducts to air terminal units.

D. Make connections to air terminal units with flexible connectors complying with requirements in Section 23 33 00 "Air Duct Accessories."

3.5 IDENTIFICATION

A. Label each air terminal unit with plan number, nominal airflow, and maximum and minimum factory-set airflows. Comply with requirements in Section 23 05 53 "Identification for HVAC Piping and Equipment" for equipment labels and warning signs and labels.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections:
   1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
   2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
   3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Air terminal unit will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.7 STARTUP SERVICE

A. Perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
   3. Verify that controls and control enclosure are accessible.
   4. Verify that control connections are complete.
   5. Verify that nameplate and identification tag are visible.
   6. Verify that controls respond to inputs as specified.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

END OF SECTION 23 36 00

SECTION 23 37 13

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Perforated diffusers.
   2. Adjustable bar registers and grilles.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:
   1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
   2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

C. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
   1. Ceiling suspension assembly members.
   2. Method of attaching hangers to building structure.
   3. Size and location of initial access modules for acoustical tile.
   4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
   5. Duct access panels.

B. Source quality-control reports.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Perforated Diffuser:
   1. Manufacturers:
      a. Price Industries.
      b. Titus.
      c. Trox.
   2. Devices shall be specifically designed for variable-air-volume flows.
   3. Material: Steel backpan and pattern controllers, with steel or aluminum face.
   4. Finish: Baked enamel, color selected by Architect.
   5. Duct Inlet: Round.
   6. Face Style: Flush.
   7. Dampers: Opposed blade.
   8. Accessories:
      a. Equalizing grid.
      b. Plaster ring.
      c. Safety chain.
      d. Wire guard.
      e. Sectorizing baffles.
      f. Operating rod extension.

2.2 REGISTERS AND GRILLES

A. Adjustable Bar Grille :
   1. Material: Steel or Aluminum.
   2. Full acoustical data must be submitted with any substitution request and higher noise generating equipment will be rejected.
   3. Finish: Baked enamel, color selected by Architect.

2.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13

SECTION 23 74 13

PACKAGED OUTDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Packaged roof top unit.

B. Unit controls.

C. Remote panel.

D. Roof mounting curb and base.

E. Maintenance service.

1.2 RELATED REQUIREMENTS

A. Section 07 62 00 - Sheet Metal Flashing and Trim.

B. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

C. Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.

D. Section 23 40 00 - HVAC Air Cleaning Devices.

E. Section 23 09 13 - Instrumentation and Control Devices for HVAC: Control components, time clocks.

F. Section 23 09 13 - Instrumentation and Control Devices for HVAC: Installation of thermostats and other controls components.

G. Section 26 27 17 - Equipment Wiring: Installation and wiring of thermostats and other controls components; wiring from unit terminal strip to remote panel.

H. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2008.

B. AHRI 270 - Sound Rating of Outdoor Unitary Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2008.

C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilation Systems; National Fire Protection Association; 2012.

1.4 PERFORMANCE REQUIREMENTS

A. The AHUs shall meet the performance as indicated on the schedule.

1.5 SUBMITTALS

A. See Section 01 33 00 Submittal Procedure.

B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

C. Shop Drawings: Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

D. Electrical Requirements: Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.

E. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.

F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Filters: One set for each unit.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect units from physical damage by storing off site until roof mounting curbs are in place, ready for immediate installation of units.

1.8 WARRANTY

A. See Section 01 78 36 - Warranties, for additional warranty requirements.

B. Provide a five year warranty to include coverage for refrigeration compressors.

C. A parts warranty for one year from date of start-up or 18 months from date of shipment, whichever comes later.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Daikin: www.mcquay.com.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 AIR CONDITIONING UNITS

A. General: Roof mounted units having electric heat pump heating and refrigeration.

B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.

C. Electrical Characteristics:
   1. Refer to Section 26 27 26 Wiring Devices.

D. Disconnect Switch: Factory mount disconnect switch in control panel.

2.3 FABRICATION

A. Unit Base: The unit base design shall allow unit to rest on top of roofcurb when field installed. Entire length and width under base shall be sealed in the field with curb gasketing for weather tight seal.

B. All panels shall be double wall construction. Interior and exterior panels shall be constructed of galvanized steel. Panel insulation system shall provide a minimum R value of 12. Insulation shall conform to NFPA 90 requirements.

C. Supply Fans: Provide supply fan sections with AF single width, single inlet centrifugal plug fans designed and suitable for class of service indicated on unit schedule. Fan shaft to be properly sized and protectively coated width lubricating oil. Fan shafts shall be solid and properly designed so that fan shaft does not pass through first critical speed as unit comes up to rated RPM. Fans shall be statically and dynamically tested as an assembly at the required RPM to meet design specifications. key fan wheels to fan shaft to prevent slipping. Equip centrifugal plug fans with self-aligning, grease lubricated pillow-block ball bearings selected for L-50 400,000 hour average life per ANSI/AFBMA 9. Extend both grease lubrication fittings to drive side of unit with plastic tubes and zerk fittings rigidly attached to drive side bearing support.
   1. Isolation: Mount fans on isolation bases. Internally mount motors on same isolation bases and internally isolate fans and motors with 1 inch spring isolators. Install flexible canvas ducts between fan and casings to ensure complete isolation. Flexible canvas ducts shall comply with NFPA 90A. If no isolators or flexible canvas duct is provided, then the entire unit shall be externally isolated from the supply duct work and piping by contractor in order to avoid transmission of noise and vibration through the ductwork.
   2. Access: Fan sections shall have full height, double wall, hinged doors on drive side for inspection and maintenance of internal components. Fan sections with plug fans shall have galvanized expanded metal access door guards to prevent unauthorized entry into fan sections when access doors are opened. Design access door guards for removal from outside of unit. On plug fan sections with vertical down discharge, a safety grate shall cover the entire discharge opening to prevent service personnel from falling into supply air ductwork.

D. Provide VFD fan motor drives for all units.

E. Air Filters: As scheduled. Provide factory-fabricated filter section of the same construction and finish as unit casings. Filter sections shall have filter guides and full height, double-wall, hinged doors for filter removal. Filter sections shall flange to other unit components. Provide filter blockoffs as required to prevent air bypass around filters.

F. Drain Pan: The sealed double wall drain pan shall be constructed of Galvanized steel and insulated to prevent sweating. The bottom of the drain pan shall be sloped in two planes which pitch the condensate to the drain connection.

G. Cabinet: Steel with baked enamel finish, including access panels with screwdriver operated flush cam type fasteners. Structural members shall be minimum 18 gage, with access doors or panels of minimum 20 gage.

H. Insulation: one inch thick neoprene coated glass fiber with edges protected from erosion.

I. Heat Exchangers: Aluminized steel, of welded construction.

J. Supply Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch motor pulley, and rubber isolated hinge mounted high efficiency motor or direct drive as indicated. Isolate complete fan assembly. Refer to Section 23 05 48.

K. Air Filters: 1 inch thick glass fiber disposable media in metal frames. Refer to Section 23 40 00.

L. Roof Mounting Curb: 21 inches high galvanized steel, channel frame with gaskets, nailer strips.

2.4 EVAPORATOR COIL

A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.

B. Provide capillary tubes or thermostatic expansion valves for units of 6 tons capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons cooling capacity and larger.

2.5 COMPRESSOR

A. Provide hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gage ports, and filter drier.

2.6 CONDENSER COIL

A. Provide copper tube aluminum fin coil assembly with subcooling rows and coil guard.

B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors.

2.7 OPERATING CONTROLS

A. The programmable DDC controller shall be fully compatible with a Building Automation System. Complete communications and diagnostics including all AI, BI, AO, BO, set points, and alarms shall only require a twisted pair of wires. System optimization strategies shall be available to perform such energy management functions as resetting chilled water temperature upward until one valve is fully open.

B. Provide low voltage, adjustable room thermostat to control compressor and condenser fans and supply fan to maintain temperature setting.
   1. Include system selector switch (heat-off-cool) and fan control switch (auto-on).

C. Provide terminal strip on unit for connection of operating controls to remote panel by others. Control shall allow for two stages of heating and two stages cooling.

D. Provide remote mounted fan control switch (on-auto).

E. Provide low limit thermostat in supply air to close outside air damper and stop supply fan.

F. Provide night control energized by central time clock to maintain lower thermostat setting, lock out refrigeration, close outside air damper and open return air damper, stop supply air fan, for night and unoccupied operation. Provide time delay to maintain outside air damper closed and return air damper open after switching to day and occupied operation.

2.8 HEAT RECOVERY WHEEL

A. Casing
   1. Steel with standard factory painted finish.
   2. Support vertical rotors on grease lubricated ball bearings having extended grease fittings. Support horizontal rooters on tapered roller bearing.

B. Filters
   1. Factory-fabricated, viscous-coated, flat-panel type.

2.9 VARIABLE FREQUENCY DRIVE (VFD)

A. Combination Variable Frequency Drive with Bypass / line break switches shall be properly sized, mounted, wired to the fan motor, and commissioned by the AHU manufacturer. Combination VFD / line break switches shall include the VFD, a circuit breaker disconnect, bypass circuitry, a Drive-Bypass switch, an H-O-A switch, a manual speed control dial, and a control transformer. Factory mounting will facilitate temporary heating, cooling, ventilation, and / or timely completion of the project.

B. VFD: The VFD shall be a high performance pulse width modulated (PWM) AC drive that generates a sine-code, variable voltage/frequency, three phase output for optimum speed control. The inverter section shall utilize only intelligent power modules (IPM's) to generate an 8kHz PWM output to ensure a low audible magnetic motor noise (@ 60 Hz) of less than 2 dB (@ 1 meter) above across the line operation. Power electronics shall provide at least 96% efficiency. The VFD shall be digitally based using a common microprocessor control logic circuit board for the horsepower ratings. All programming shall be maintained in non-volatile RAM memory so the program will be maintained when power is removed. A digital operator keypad and display shall provide local control and readout for: run/stop, speed, reset, volts, amps, kilowatts, and diagnostics. Output current overload should be rated at 110% of motor FLA for one minute. The VFD shall have the following minimal protective features: current limited stall prevention, auto restart after momentary power loss, speed search for starting into rotating motor, anti-windmill w/DC injection before start, phase-to-phase short circuit protection, and ground fault protection. Ambient service temperature rating of -10 to 50 degrees C, and humidity rating to 95% non-condensing. The VFD

shall be UL508C listed and CSA certified and shall conform to applicable NEMA, ICS, NFPA, IEC, AND ISO 9001 standards.

C. Enclosure: VFD / Line Break Switch shall have full metal enclosures. Enclosures shall be weather tight and completely recessed inside the standard unit casing. The door should be identical construction to the access doors on the air handler. A manual shut down switch shall be located on the outside of the access door.

D. Factory-Mounting: VFD/Disconnect shall be factory-mounted on the drive side of the air handling unit fan section. Ensure four feet of clearance to access panel.

E. Factory Commissioning: Trained factory personnel shall ensure proper operation of the VFD by a thorough factory test. Testing shall include "Hi-pot" test of unit wiring to insure that no weaknesses exist in VFD, wiring, or motor. VFD should be energized and fan run at 22Hz, 40Hz, and 60Hz to insure VFD will operate throughout usable range of drive and that the fan rotation is correct. If VFD has bypass, fan will additionally be tested in bypass position to insure bypass is operational.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.

B. Verify that proper power supply is available.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NFPA 90A.

C. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

D. Locate remote panels where indicated on drawings.

3.3 SYSTEM STARTUP

A. Prepare and start equipment. Adjust for proper operation.

3.4 CLOSEOUT ACTIVITIES

A. Demonstrate operation to Owner's maintenance personnel.

3.5 MAINTENANCE

A. See Section 01 70 00 - Execution Requirements, for additional requirements relating to maintenance service.

B. Provide a separate maintenance contract for specified maintenance service.

C. Provide service and maintenance of packaged roof top units for one year from Date of Substantial Completion.

D. Provide routine maintenance service with a two month interval as maximum time period between calls.

E. Include maintenance items as outlined in manufacturer's operating and maintenance data, including minimum of six filter replacements, minimum of one fan belt replacement, and controls check-out, adjustments, and recalibration.

F. Provide 24-hour emergency service on breakdowns and malfunctions.

G. After each service call, submit copy of service call work order or report that includes description of work performed.

END OF SECTION 23 74 13

SECTION 23 81 29

VARIABLE REFRIGERANT FLOW (VRF) SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Variable refrigerant flow (VRF) system with heat recovery, consisting of:
   1. Outdoor/Condensing unit(s).
   2. Heat Recovery Units/Branch Selector Boxes
   3. Indoor/Evaporator units.
   4. Refrigerant piping.
   5. Control panels.
   6. Control wiring.
   7. Controls interface.
   8. BACnet gateway.

1.2 RELATED REQUIREMENTS

A. Section 01 79 00 - Demonstration and Training.

B. Section 01 91 13 - General Commissioning Requirements.

C. Section 01 91 14 - Commissioning Authority Responsibilities.

D. Section 22 10 05 - Plumbing Piping: Condensate drain piping.

E. Section 22 30 00 - Plumbing Equipment: Cooling condensate removal pumps.

F. Section 23 08 00 - Commissioning of HVAC.

G. Section 23 23 00 - Refrigerant Piping and Specialties: Additional requirements for refrigerant piping system.

H. Section 26 27 17 - Equipment Wiring: Power connections to equipment.
   1. Provide separate power connections for each unit of equipment.

1.3 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2008.

B. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2011.

C. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2009.

D. ASHRAE Std 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings; American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc; 2010, Including All Addenda (ANSI/ASHRAE/

E. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 1995 - Heating and Cooling Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Pre-Bid Submittals: For proposed substitute systems/products, as defined in PART 2, proposer shall submit all data described in this article, under the terms given for substitutions stated in PART 2.

C. Design Data:
   1. Provide design calculations showing that system will achieve performance specified.
   2. Provide design data required by ASHRAE 90.1.

D. Product Data: Submit manufacturer's standard data sheets showing the following for each item of equipment, marked to correlate to equipment item markings shown in the contract documents:
   1. Outdoor/Central Units:
      a. Refrigerant Type and Size of Charge.
      b. Cooling Capacity: BTU/h.
      c. Heating Capacity: BTU/h.
      d. Cooling Input Power: BTU/h.
      e. Heating Input Power: BTU/h.
      f. Operating Temperature Range, Cooling and Heating.
      g. Fan speed control: Variable speed or number of discrete speeds (e.g. low, medium, high).
      h. Air Flow: Cubic feet per minute.
      i. Fan Curves.
      j. External Static Pressure (ESP): Inches WG.
      k. Sound Pressure Level: dB(A).
      l. Electrical Data:
         1) Power Supply: Volts and Phase.
         2) Full Load Amps (FLA).

3) Fan Motor: HP.
4) Maximum Circuit Amps (MCA).
5) Maximum Fuse Amps (MFA).
6) Maximum Starting Current (MSC).
7) Total Over Current Amps (TOCA).

m. Weight and Dimensions.
n. Maximum number of indoor units that can be served.
o. Maximum refrigerant piping run from outdoor/condenser unit to indoor/evaporator unit.
p. Maximum height difference between outdoor/condenser unit to indoor/evaporator unit, both above and below.
q. Control Options.

2. Branch Selector/Heat Recovery Units:
   a. Maximum Connectable Cooling Capacity: BTU/h.
   b. Sound Pressure: dB(A).
   c. Number of Connectable Indoor Units:
   d. Weight and Dimensions
   e. Electrical Data:
      1) Power Supply: Volts and Phase.
      2) Full Load Amps (FLA).
      3) Maximum Circuit Amps (MCA).
      4) Maximum Fuse Amps (MFA).
   f. Weight and Dimensions.
3. Indoor/Evaporator Units:
   a. Cooling Capacity: BTU/h.
   b. Heating Capacity: BTU/h.
   c. Cooling Input Power: BTU/h.
   d. Heating Input Power: BTU/h.
   e. Fan speed control: Variable speed or number of discrete speeds (e.g. low, medium, high).
   f. Air Flow: Cubic feet per minute.
   g. Fan Curves.
   h. External Static Pressure (ESP): Inches WG.
   i. Sound Pressure level: dB(A).
   j. Electrical Data:
      1) Power Supply: Volts and Phase.
      2) Full Load Amps (FLA).
      3) Fan Motor: HP.
      4) Maximum Circuit Amps (MCA).
      5) Maximum Fuse Amps (MFA).
      6) Maximum Starting Current (MSC).
      7) Total Over Current Amps (TOCA).
   k. Maximum Lift of Built-in Condensate Pump.
   l. Weight and Dimensions.
   m. Control Options.

4. Shop Drawings: Schematic flow diagram showing fans, coils, dampers, outdoor units, indoor units, branch selector units and control devices.
5. Bill of Materials: A table, including quantities, of all equipment, controllers, and devices to be provided.
6. Controls:
    a. System architecture one-line diagram indicating schematic location of all controlled devices, controllers, gateways and interfaces.
    b. Physical location of all user interfaces indicated on plans.
    c. Physical location of all thermostats indicated on plans.
    d. List of all available hardwired points, if any. Indicate where and at which device connection is made physically.
    e. List of all available BACnet network points. Indicate where and at which device connection is made physically.
    f. List of anticipated control zones, indicating setpoints and schedule to be programmed for each zone.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:
    1. Manufacturer has been producing VRF heat pump systems for at least 5 years.
    2. Manufacturer provides system design software to installers.

B. Installer Qualifications: Factory-authorized installed trained and certified by manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle equipment and refrigerant piping according to manufacturer's recommendations.

B. Store equipment indoors.

C. All duct and pipe segments shall remain capped and clean until ready for installation.

1.8 WARRANTY

A. The entire VRF system shall be warranted by a single manufacturer or entity.

B. Compressors
    1. Installing contractor shall furnish and submit additional tests and/or registration as required by the manufacturer to obtain the maximum available compressor warranty beyond the basic warranty period. Requirements vary by manufacturer. Contractor shall review and comply with manufacturer requirements for installed system.

C. Units, including all parts and compressor, shall be covered under this extended warranty.

D. All warranty service work shall be performed by a factory trained service professional.

E. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design
   1. The system design shown in Contract Drawings is based on equipment and system designed by Mitsubishi; www.mylinkdrive.com.
   2. The entire VRF system, excluding commodities such as wire and pipe, shall be provided by a single manufacturer and shall be warranted as a system.

B. Systems designed and manufactured by other manufacturers will be considered by Engineer of Record under the terms described for substitutions with the following conditions:
   1. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Substitution requests will be considered only if received at least 10 days prior to the bid date. Substitutions first proposed at submittal time will not be accepted.
   3. Substitution requests will be considered only if required submittal data is complete; see article SUBMITTALS above.
   4. Contractor (not equipment supplier) shall certify that the use of the substitute system and equipment will not require changes to other work or re-design by Architect.
   5. Contractor shall be wholly responsible for coordinating, documenting and implementing any VRF system design changes necessitated by the substitution.
      a. Substitution shall not result in additional costs to the Owner.
      b. Substitution shall not result in additional design time for the Engineer of Record.
      c. Contractor shall provide shop drawings and as-built drawings in Revit or AutoCAD format.
   6. Contractor or HVAC subcontractor shall certify that the substitute system will achieve the performance specified.
   7. Do not assume substitution has been accepted until formal written notice has been issued by Architect.
   8. Proposed substitution heat pump system shall have published performance ratings certified by AHRI (Air-Conditioning, Heating, and Refrigeration Institute) and listed in the AHRI Standard 1230 certified product directory

2.2 HVAC SYSTEM DESIGN

A. General:
   1. Provide a complete functional system that achieves the specified performance based on the specified design conditions and that is designed and constructed according to the equipment manufacturer's requirements.

2. See Contract Drawing mechanical schedules for performance requirements and design conditions.
3. Zone Control
   a. Provide a thermostat for every zone.
   b. Provide capability for space temperature control for each individual indoor/evaporator unit independently of all other units.
   c. Provide ability for each individual indoor/evaporator unit to select heating or cooling independently of all other units.
4. The following information is provided on Contract Drawing mechanical plans:
   a. Map of zones/conditioned spaces
   b. Outdoor condenser unit locations
   c. Indoor evaporator unit locations
   d. Branch selector unit locations
   e. Refrigerant piping location and sizes
   f. Condensate piping (by others)
5. VRF system shall be capable of continuous operation when one or more indoor units are being serviced or power to indoor unit is disconnected. Systems that alarm and/or shut down because of a lack of power to any number of indoor units shall not be acceptable or allowed.

B. Connection Ratio
1. The ratio of nominal indoor unit capacity to nominal outdoor unit capacity shall not exceed that implied by equipment selections listed in Contract Drawings mechanical schedule.
2. Contractor is responsible for calculating the connection ratio based on scheduled equipment.
3. In any case, connection ratio shall not exceed 150% without explicit permission from VRF system manufacturer.

C. Setpoints shall be as indicated on Contract Drawing zone schedule or as follows:
1. Occupied Heating Setpoint: 68°F
   a. Heating Setpoint Range: 65°F - 75°F
2. Occupied Cooling Setpoint: 72°F
   a. Cooling Setpoint Range: 70°F - 80°F
3. Unoccupied Heating Setpoint: 60°F
4. Unoccupied Cooling Setpoint: 85°F
5. Heating and cooling setpoints shall be independently adjustable, as required by California Title 24.
6. VRF control system shall prevent:
   a. The heating setpoint from exceeding the cooling setpoint minus 2°F (i.e. the minimum difference between heating and cooling setpoints shall be 2°F)
   b. The unoccupied heating setpoint from exceeding the occupied heating setpoint; and
   c. The unoccupied cooling setpoint from being less than the occupied cooling setpoint.

D. Outside Air Design Conditions: per mechanical schedule

E. Operating Temperature Ranges:
   1. Simultaneous Heating and Cooling Operating Range: minus 14°F to 60°F dry bulb.
   2. Cooling Mode Operating Range: 23°F to 110°F dry bulb.
   3. Heating Mode Operating Range: 0°F to 77°F dry bulb; minus 4°F to 60°F wet bulb
   4. Heating mode shall not require low ambient kit or auxiliary heat source.

F. Wiring: Per manufacturer recommendations.

G. Refrigerant Piping:
   1. Provide pipe of material and type corresponding to manufacturer requirements, and length as required by system design.
   2. Refrigerant piping layout shall be designed so as to not require oil traps.

H. VRF System Controls:
   1. System operation shall be controlled by a factory-installed microprocessor-based system controller which is integral to the VRF system.
   2. Install with hardwired control or network connections between outdoor unit(s) and indoor unit(s) so that entire VRF system is controlled as integrated whole. All features and functions of the entire VRF system, including indoor units, shall be available from the systems control panel.
   3. System shall provide time-based occupancy schedules and control overrides of indoor and outdoor units.
   4. System controller shall automatically perform ongoing self-diagnostics and shall notify users of faults and alarms via controls panel (below).
   5. Provide with connection for demand response load shed signal from utility.
   6. Provide the following control interfaces:
      a. For each indoor/evaporator Unit: One wall-mounted wired local controller/thermostat, with temperature sensor; locate where indicated on Contract Drawings.
      b. System controls panel, capable of controlling all indoor units and supporting all features listed in previous paragraph. Locate where indicated on Contract Drawings.
   7. BACnet gateway, capable of communicating with a BACnet-based BAS system using native BACnet objects and protocol. Connection and mapping of gateway to BAS shall be by DDC Contractor.
   8. The system shall be capable of performing continuous operation when an individual or several indoor units are being serviced or power to indoor unit is disconnected. Systems that alarm and/or shut down because of a lack of power to any number of indoor units shall not be acceptable or allowed

I. Local Controllers/Thermostats
   1. Thermostat/controller shall be wall-mounted, wired, containing temperature sensor in a ventilated cover.
   2. Provide with insulated base.
   3. There shall be three types of thermostats.
      a. Type 1 – No Display, No Controls
         1) Blank cover
         2) No occupant controls
      b. Type 2 – With Display, No Controls
         1) Cover shall include integral LCD display showing current temperature and active setpoint.
         2) No occupant controls.
      c. Type 3 – With Display, With Controls
         1) Display per Type 2 thermostat.
         2) Include means for occupant to adjust setpoint (buttons, dials, or sliders).
         3) Include override pushbutton ("janitor's button") capable of being programmed to start system outside of scheduled occupancy.
   4. Unless otherwise called out on Contract Drawing mechanical floorplans or zone schedule, install thermostat Types based on location:
      a. Open offices: Type 2
      b. Private offices: Type 3
      c. Corridors/hallways: Type 1
      d. Conference/meeting rooms: Type 3
      e. Classrooms, labs, multi-purpose rooms: Type 3
      f. Lobbies, public spaces: Type 2
      g. Equipment rooms and other back-of-house spaces: Type 2
      h. Others not listed: Request clarification from Engineer of Record

J. Sequences of Operations
   1. VRF system control shall be by control logic residing in the VRF system controller.
   2. VRF system control shall be connected to DDC BAS as shown on Contract Drawing control schematics.
   3. VRF control system shall monitor and log all alarms and faults, and display them at the control interface.
   4. VRF control system shall maintain a schedule of occupancy as follows.
      a. Weekday occupied hours: 7:00 AM – 7:00 PM
      b. Weekend occupied hours: None.
   5. VRF control system shall operate VRF outdoor and indoor units as required to maintain temperature of each space between its currently active (i.e. occupied, or unoccupied) cooling setpoint and heating setpoint.

2.3 EQUIPMENT

A. All Units: Factory assembled, wired, and piped and factory tested for function and safety.
   1. Refrigerant: R-410A.
   2. Performance Certification: AHRI Certified; www.ahrinet.org. EER and COP values shall be based on tests conducted at "full load" in accordance with AHRI 210/240 or alternate test method approved by U.S. Department of Energy.
   3. Safety Certification: Tested to UL 1995 by UL or Intertek-ETL and bearing the certification label.
   4. Provide units capable of serving the zones indicated.
   5. Thermal Performance: Provide heating and cooling capacity as indicated, based on operating conditions described in Paragraph 2.2E.
   6. Energy Efficiency: Provide units with EER and/or COP equal or better to that listed in the Contract Drawing mechanical schedule.
   7. Outdoor Units: Units and their supports designed and installed to resist wind pressures defined in ASCE 7 for the Project location.

B. Electrical Characteristics per Contract Drawing mechanical equipment schedule.

C. Refrigerant Piping
   1. Provide two-pipe or three-pipe refrigerant system.
   2. Refrigerant Flow Balancing: Provide refrigerant piping joints and headers specifically designed to ensure proper refrigerant balance and flow for optimum system capacity and performance.
   3. Insulate each refrigerant line individually between the condensing and indoor units.
   4. Service valve shall be provided at each refrigerant piping connection to equipment (indoor units, outdoor units (each frame), and heat recovery units) to allow for servicing for VRF system without evacuating the entire piping system.

D. Software
   1. Any software or smartphone apps associated with or required for the installation, testing, troubleshooting, maintenance, programming, operation or expansion of the VRF system shall be provided at no cost to the owner.
   2. If software is licensed on an annual basis, include the cost of at least five (5) years licensing with initial bid. In addition, clearly indicate on bid the requirement for and the cost of the annual license starting with the fifth year after installation.

2.4 OUTDOOR/CONDENSING UNITS

A. Outdoor/Condensing Units: Air-cooled DX refrigeration units, designed specifically for use with provided indoor/evaporator units; factory assembled and wired with all necessary electronic and refrigerant controls.
   1. Refrigeration Circuit: Scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports and refrigerant regulator.
   2. Refrigerant: Factory charged.
   3. Variable Volume Control: Modulate compressor capacity automatically to maintain constant suction and condensing pressures while varying refrigerant volume to suit heating/cooling loads.
   4. Capable of being installed with wiring to the left, right, rear or bottom.
   5. Capable of being installed with piping to the front or bottom.
   6. Modular design capable of being ganged for higher capacity.
   7. Heating:
      a. Capable of heating operation at low end of operating range as specified, without additional low ambient controls or auxiliary heat source.
      b. Provide with low-ambient kit only if specified in Contract Drawing mechanical schedules.
      c. Supplemental electric heat is not acceptable.
   8. Defrost and oil recovery operating mode shall not produce indoor space cooling. During mode operation, temporarily disable indoor unit fan, or continue to provide heating (e.g. with split coil).
   9. Sound Pressure Level Control: As specified, measured at 3 feet from front of unit; provide night setback sound control as a standard feature; three selectable sound level steps of 59 dB, 56 dB, and 53 dB, maximum or as shown on Contract Drawing mechanical schedule.
   10. Power Failure Mode: Automatically restart operation after power failure without loss of programmed settings.
   11. Safety Devices: High pressure sensor and switch, low pressure sensor/switch, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
   12. Oil Recovery Cycle: Automatic and periodic, or as needed based on oil level switch.

B. Unit Cabinet: Weatherproof and corrosion resistant; rust-proofed mild steel panels coated with baked enamel finish.
   1. Designed to allow side-by-side installation with minimum spacing

C. Fans:
   1. Direct-drive propeller type fan with variable speed operation via variable frequency drive (VFD) or electronically commutated motor (ECM).
   2. Fan Airflow: Per Contract Drawing mechanical schedule

3. Fan Motors: Factory installed; permanently lubricated bearings; inherent protection; fan guard; output as indicated for specific equipment.

D. Condenser Coils:
   1. Copper or aluminum tubes expanded into aluminum fins to form mechanical bond; waffle louver fin and rifled bore tube design to ensure high efficiency performance.
   2. Corrosion Protection: Fins coated with anti-corrosion resin and hydrophilic film or similar; pipe plates coated with powdered polyester powder coating or similar.

E. Compressors: Scroll type, hermetically sealed, and variable speed inverter-driven;
   1. Variable Speed Control
      a. Capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure.
      b. Compressor capacity control by changing inverter frequency.
      c. Staging of fixed speed compressors for capacity control is also acceptable, but there must be minimum one variable speed compressor to permit fine modulation of capacity.
   2. Multiple Condenser Modules: Balance total operation hours of compressors by means of duty cycling function, providing for sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost, or every 8 hours.
   3. Failure Mode: In the event of compressor failure, operate remaining compressor(s) at proportionally reduced system capacity manually or automatically; provide microprocessor and associated controls specifically designed to address this condition.
   4. Inverter Driven Compressors: PVM inverter driven, highly efficient reluctance DC (digitally commutating), hermetically sealed scroll.
   5. Rotors: Incorporating neodymium magnets for higher torque and efficiency.
   6. Provide each compressor with crankcase heater, high pressure safety switch, and internal thermal overload protector.
   7. Provide oil separators and intelligent oil management system.
   8. Compressor shall be isolated to avoid the transmission of vibration.

2.5 BRANCH SELECTOR/HEAT RECOVERY UNIT

A. Branch Selector/Heat Recovery Units: Concealed boxes rated for plenum installation, designed specifically for this type of system to control heating/cooling mode selection of downstream units; consisting of electronic expansion valves, subcooling heat exchanger, refrigerant control piping and electronics to facilitate communications between unit and main processor and between branch unit and indoor/evaporator units.
   1. Control direction of refrigerant flow using electronic expansion or solenoid valves.
   2. Provide one electronic expansion valve for each downstream unit served, except multiple indoor/evaporator units may be connected, provided balancing joints are

used in downstream piping and total capacity is within capacity range of the branch selector.
   a. Alternative: Systems with expansion valves located at indoor units are acceptable.
3. When branch unit is simultaneously heating and cooling, energize subcooling heat exchanger.
4. Casing: Galvanized steel sheet with resin drain pan.
5. Insulation: Case shall be insulated, or all refrigerant piping and components shall be insulated.
6. Refrigerant Connections: Braze or flare type.
7. Condensate Drainage: Provide condensate drainage as required.
8. The VRF manufacturer shall provide published documentation that specifically allows the installation of field provided isolation valves on all pipes connected to the Heat Recovery unit, or shall provide said valves factory installed, to allow the servicing of HR units, refrigerant circuit or the replacement of HR unit without evacuating the balance of the piping system.

2.6 INDOOR/EVAPORATOR UNITS

A. Contractor shall provide indoor units of quantity and type shown on Contract Drawings plans and schedules. Do not substitute unit types without written permission from Engineer of Record. Do not submit unit types which are not included in Project, even if listed in this Section.

B. All Indoor/Evaporator Units: Factory assembled and tested DX fan-coil units, with electronic proportional expansion valve, control circuit board, factory wiring and piping, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
   1. Refrigerant: Refrigerant circuits factory-charged with dehydrated air, for field charging.
   2. Temperature Control Mechanism: Return air thermistor and computerized Proportional-Integral-Derivative (PID) control of superheat.
   3. Dehumidification/Drying Function: In conjunction with wall-mounted wired remote controller.
   4. Coils: Direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond; waffle louver fin and high heat exchange, rifled bore tube design; factory tested.
      a. 2-, 3-, or 4-row cross fin design with 14 to 17 fins per inch.
      b. Sweat or flare connections to refrigerant piping.
      c. Provide thermistor on liquid and gas lines.
   5. Fans: Direct-drive, with statically and dynamically balanced impellers; minimum two speed (high and low) or continuously variable speed unless otherwise indicated; motor thermally protected.
   6. Supply Airflow Adjustment for ceiling cassette style units:
      a. Via motorized louvers which can be horizontally and vertically adjusted from 0 to 90 degrees.

b. Field-modifiable to 3-way and 2-way airflow.
c. Three auto-swing positions, including standard, draft prevention and ceiling stain prevention.

7. Sound Pressure: No more than 6 dB(A) or as specified in mechanical schedule or noted below for specific unit types. Measured at low speed at 5 feet below unit.
8. Return Air Filter: Washable long-life net filter with mildew proof resin and antifungal treatment, unless otherwise indicated. Filter shall be accessible from room (ceiling-mounted units only).
9. Condensate Pan: Built-in mildew-proof condensate drain pan with connection. Include condensate safety shutoff and alarm.
10. Condensate Pump: If gravity drainage of condensate is not feasible, include built-in or provide with condensate pump, with lift as required by application.
11. Cabinet Insulation: Sound absorbing foamed polystyrene and polyethylene insulation.

C. Recessed Ceiling Units (Ductless)
1. Provide 2 FT by 2 FT: Four-way airflow cassette with central return air grille, for installation in standard 24 by 24 inch lay-in ceiling grid.
2. Provide 3 FT by 3 FT: Four-way airflow cassette with central return air grille, for installation in fixed ceiling.
3. Cabinet Height: Maximum of 12 inches above ceiling.
4. Exposed Housing: White, impact resistant, with washable decoration panel.
5. Maintenance Access: All electrical components accessible through decoration panel.
   a. Side unit access is acceptable with lay-in ceiling installations.
6. Supply Airflow Adjustment:
   a. Via motorized louvers which can be horizontally and vertically adjusted from 0 to 90 degrees.
   b. Field-modifiable to 3-way and 2-way airflow.
   c. Three auto-swing positions, including standard, draft prevention and ceiling stain prevention.
7. Condensate pump must be concealed.
8. Provide supply air branch duct connection with knock-out plug.
9. Provide fresh air intake duct connection with knock-out plug.

D. Wall or Floor Surface-Mounted Units (Ductless)
1. White, finished casing, with removable front grille
2. Includes sound insulation
3. Provide with mounting brackets
4. Mildew-proof drain pan
5. Include built-in or provide with condensate pump, with lift as required by application.
6. Sound Pressure: No more than 43 dB(A) or as specified in mechanical schedule. Measured at low speed at 5 feet from unit.

E. Ducted Units
   1. Ducted discharge and return; powder coated or galvanized steel cabinet.
   2. Provide external static pressure switch adjustable for high efficiency filter operation
   3. Mildew-proof drain pan
   4. Include built-in or provide with condensate pump, with lift as required by application.
   5. Where high efficiency filters are indicated on schedule, provide air filter rack.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that required electrical services have been installed and are in the proper locations prior to starting installation.

B. Verify that condensate piping has been installed and is in the proper location prior to starting installation.

C. Notify General Contractor/Construction Manager and Engineer of Record if conditions for installation are unsatisfactory.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install refrigerant piping in accordance with equipment manufacturer's instructions.

C. Insulate all refrigerant piping and specialties with minimum 1” pipe insulation or more if required by local code.

D. Perform wiring in accordance with NFPA 70, National Electric Code (NEC).

E. Coordinate with installers of systems and equipment connecting to this system.

3.3 FIELD QUALITY CONTROL

A. Provide manufacturer's field representative to inspect installation prior to startup.

3.4 SYSTEM STARTUP

A. Provide manufacturer's field representative to perform system startup.

B. Prepare and start equipment and system in accordance with manufacturer's instructions and recommendations.

C. Adjust equipment for proper operation within manufacturer's published tolerances.

D. Submit startup forms with Pre-Functional Test report.

3.5 CLEANING

A. Clean exposed components of dirt, finger marks, and other disfigurements.

3.6 COMMISSIONING

A. See Section 01 91 13 for commissioning requirements.

B. Perform commissioning as specified in Section 23 08 00.

C. Perform Functional Tests as specified by Commissioning Authority and Commissioning Coordinator. At minimum, perform the following tests and provide Functional Test report for approval before closeout submittal.
   1. Override system clock to verify that system turns on and shuts off in accordance with programmed schedule and system clock.
   2. Override or manipulate (e.g. with hot air gun or compressed air can) zone temperature readings at each zone to verify appropriate heating or cooling response.
   3. Simultaneously override or manipulate temperatures in two zones on the same branch of the same outdoor unit so as to induce heating in one zone and cooling in the other, to verify that system can provide heating and cooling simultaneously.

3.7 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Provide Owner with System Manual including approved submittal, as-built mechanical and control drawings, as-built piping drawings, O&M's, troubleshooting guides, service manuals and engineering manuals in PDF format.

D. Demonstrate proper operation of equipment to Owner's designated representative.

E. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Briefly describe function, operation, and maintenance of each component.

F. Training: Train Owner's personnel on operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of two hours of training.
   3. Instructor: Manufacturer's training personnel.
   4. Location: At project site.

3.8 PROTECTION

A. Protect installed components from subsequent construction operations.

B. Replace exposed components broken or otherwise damaged beyond repair.

3.9 MAINTENANCE

A. See Section 01 70 00 - Execution Requirements, for additional requirements relating to maintenance service.

B. Provide a separate maintenance contract for specified maintenance service.

END OF SECTION 23 81 29

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Building wires and cables rated 2000 V and less.
   2. Connectors, splices, and terminations rated 2000 V and less.

B. Related Requirements:
   1. Section 26 05 23 "Control-Voltage Electrical Power Cables" for control systems, communications cables, and Class 1, 2, and 3 control cables.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Alpha Wire Company.
   2. American Bare Conductor.
   3. Belden Inc.
   4. Cerro Wire LLC.
   5. General Cable Technologies Corporation.
   6. Service Wire Co.
   7. Southwire Company.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable used in VFC circuits.

E. Conductors: Aluminum and copper, complying with NEMA WC 70/ICEA S-95-658.
   1. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THW, Type THW-2, Type THHN/THWN-2, Type XHHW-2, and Type SO.

F. Cable: Comply with NEMA WC 70/ICEA S-95-658 for armored cable with ground wire, Type AC, metal-clad cable, Type MC, mineral-insulated, and metal-sheathed cable Type MI.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. 3M Electrical Products.
   2. AFC Cable Systems; a part of Atkore International.
   3. Gardner Bender.
   4. Hubbell Power Systems, Inc.
   5. Ideal Industries, Inc.
   6. ILSCO.
   7. NSi Industries LLC.
   8. O-Z/Gedney; a brand of Emerson Industrial Automation.
   9. Service Wire Co.
   10. Thomas & Betts Corporation, A Member of the ABB Group.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper for feeders smaller than No. 4 AWG. Copper or Aluminum (with compression lugs only) for feeders No. 4 AWG and larger. Conductors may be solid or stranded for No. 10 AWG and smaller; must be stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper; conductors may be solid or stranded for No. 10 AWG and smaller; must be stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders and branch circuits: Type THHN/THWN-2 or Type XHHW-2, single conductors in raceway; Armored cable, Type AC, or Metal-clad cable, Type MC in cable tray.

B. Feeders and branch circuits concealed above Ceilings, in hollow Walls, and Partitions: Type THHN/THWN-2 or Type XHHW-2, single conductors in raceway; Armored cable, Type AC, or Metal-clad cable, Type MC in cable tray.

C. Feeders and branch circuits concealed in Concrete: Type THHN/THWN-2 or Type XHHW-2, single conductors in nonmetallic concrete-tight raceway.

D. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain-relief device at terminations to suit application.

E. Motor Variable Speed Controller Output Circuits: Type XHHW-2 in metal conduit.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors where possible unless specifically indicated as exposed.

B. Complete raceway connections between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables. Exception: Prefab-work may be done with conductors pre-installed in raceways.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

E. Install exposed feeders and branch circuits only in specific areas where exposed electrical work is allowed, run raceways parallel and perpendicular to building surfaces and exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
   1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductors at each outlet, with at least 12 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of mechanical equipment plenum walls, exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 07 84 13 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. After installing conductors and cables and before electrical circuitry has been energized, test feeder conductors for compliance with requirements.
   2. Perform each of the following visual and electrical tests:
      a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
      b. Test bolted connections for high resistance using one of the following:
         1) A low-resistance ohmmeter.
         2) Calibrated torque wrench.
         3) Thermographic survey.

c. Inspect compression applied connectors for correct cable match and indentation.
d. Inspect for correct identification.
e. Inspect cable jacket and condition.
f. Insulation-resistance test on each feeder conductor with respect to ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
g. Continuity test on each feeder conductor and cable.
h. Uniform resistance check of parallel feeder conductors.

3. Initial Infrared Scanning: After Substantial Completion, but before Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
   a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
   b. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

B. Cables will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports to record the following:
   1. Procedures used.
   2. Results that comply with requirements.
   3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION 26 05 19

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
   1. Grounding arrangements and connections for separately derived systems.

B. Qualification Data: For testing agency and testing agency field supervisor.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
   1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
      a. Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systems based on NFPA 70B.
         1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
         2) Include recommended testing intervals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Burndy; Part of Hubbell Electrical Systems.
   2. Dossert; AFL Telecommunications LLC.
   3. ERICO International Corporation.
   4. Galvan Industries, Inc.; Electrical Products Division, LLC.
   5. Harger Lightning & Grounding.
   6. ILSCO.
   7. O-Z/Gedney; a brand of Emerson Industrial Automation.
   8. Robbins Lightning, Inc.
   9. Siemens Power Transmission & Distribution, Inc.

2.2 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
   1. Solid Conductors: ASTM B 3.
   2. Stranded Conductors: ASTM B 8.
   3. Tinned Conductors: ASTM B 33.
   4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
   5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
   7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 2 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for

mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid or stranded conductors for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
   1. Bury at least 24 inches below grade.
   2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.

C. Grounding Bus: Install in main electrical equipment rooms, IDF closets, and elsewhere as indicated.
   1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.

D. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
   2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
   3. Connections to Ground Rods at Test Wells: Bolted connectors.
   4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Transformers: Install grounding electrode(s) at each transformer location. The grounding electrode conductor shall be sized as indicated on the drawings, connected from the transformer ground bus to building steel, and to the nearest equipment room ground bus.

3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

3.5 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.6 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

C. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. If necessary, provide tinned bonding jumper to bond across flexible duct connections to achieve continuity.

3.7 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
   2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. Report measured ground resistances that exceed the following values:
   1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
   2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
   3. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
   4. Building Switchboard and Pad-Mounted Equipment: 5 ohms.

E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify County’s Representative promptly and include recommendations to reduce ground resistance.

END OF SECTION 26 05 26

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Hangers and supports for electrical equipment and systems.
   2. Construction requirements for concrete bases.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
      a. Hangers.
      b. Steel slotted support systems.
      c. Trapeze hangers.
      d. Clamps.
      e. Turnbuckles.
      f. Sockets.
      g. Eye nuts.
      h. Saddles.
      i. Brackets.
   2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.
   1. Trapeze hangers. Include product data for components.
   2. Steel slotted-channel systems.
   3. Equipment supports.
   4. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated-Design Submittal: For hangers and supports for electrical systems.
   1. Include design calculations and details of trapeze hangers.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Suspended ceiling components.
   2. Structural members to which hangers and supports will be attached.
   3. Size and location of initial access modules for acoustical tile.
   4. Items penetrating finished ceiling, including the following:
      a. Lighting fixtures.
      b. Speakers.
      c. Projectors.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M.
   2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Retain "Delegated Design" Paragraph below if Contractor is required to assume responsibility for design.

B. Delegated Design: Contractor shall use standard hangers and support systems wherever possible. Where custom hangers and supports are required, Contractor shall Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design custom hanger and support system.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4 factory-fabricated components for field assembly.
   1. Material: Galvanized steel.
   2. Channel Width: 1-1/4 inches.
   3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   4. Channel Dimensions: Selected for applicable load criteria.

B. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
   1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened Portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
   2. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
   3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
   4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
   5. Toggle Bolts: All-steel springhead type.
   6. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 05 50 00 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems unless requirements in this Section are stricter.

B. Comply with requirements for raceways and boxes specified in Section 26-05-33 "Raceways and Boxes for Electrical Systems."

C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
   1. Secure raceways and cables to these supports with two-bolt conduit clamps.

E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
   1. To Wood: Fasten with lag screws or through bolts.
   2. To New Concrete: Bolt to concrete inserts.
   3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
   4. To Existing Concrete: Expansion anchor fasteners.
   5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
   6. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69 Spring-tension clamps.
   7. To Light Steel: Sheet metal screws.
   8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 05 50 00 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 03 30 00 "Cast-in-Place Concrete." or Section 03 30 53 "Miscellaneous Cast-in-Place Concrete."

C. Anchor equipment to concrete base as follows:
   1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   2. Install anchor bolts to elevations required for proper attachment to supported equipment.
   3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 26 05 29

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Metal conduits, tubing, and fittings.
   2. Nonmetal conduits, tubing, and fittings.
   3. Metal wireways and auxiliary gutters.
   4. Surface raceways.
   5. Boxes, enclosures, and cabinets.
   6. Handholes and boxes for exterior underground cabling.

1.3 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
   1. Structural members in paths of conduit groups with common supports.
   2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Allied Tube & Conduit; a part of Atkore International.
   2. O-Z/Gedney; a brand of Emerson Industrial Automation.

3. Republic Conduit.
4. Robroy Industries.
5. Southwire Company.
6. Thomas & Betts Corporation, A Member of the ABB Group.
7. Western Tube and Conduit Corporation.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. EMT: Comply with ANSI C80.3 and UL 797.

F. FMC: Comply with UL 1; zinc-coated steel.

G. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
   1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
   2. Fittings for EMT:
      a. Material: Steel.
      b. Type: Setscrew or compression.
   3. Fittings for GRC and IMC:
      a. Material: Steel.
      b. Type: Threaded.
   4. Expansion Fittings: Steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. AFC Cable Systems; a part of Atkore International.
   2. CANTEX INC.
   3. CertainTeed Corporation.
   4. Electri-Flex Company.
   5. RACO; Hubbell.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. ENT: UL Standard UL 1653. ENT systems shall be color coded: BLUE for branch and feeder circuit wiring, YELLOW for communications, and RED for fire alarm and emergency systems.

E. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

F. Fittings and outlet boxes for ENT shall be designed for use with ENT and listed by Underwriters Laboratories.

G. Expansion Fittings: PVC to match conduit type, complying with UL 651, rated for environmental conditions where installed.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. B-line, an Eaton business.
   2. Hoffman; a brand of Pentair Equipment Protection.
   3. MonoSystems, Inc.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, Type 3R, Type 4, or Type 12 as required for each location, and sized according to NFPA 70.
   1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Standard screw-cover type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by County's Representative.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Hubbell Incorporated; Wiring Device-Kellems.
      b. MonoSystems, Inc.
      c. Panduit Corp.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Adalet.
   2. Crouse-Hinds, an Eaton business.
   3. EGS/Appleton Electric.
   4. Erickson Electrical Equipment Company.
   5. Hoffman; a brand of Pentair Equipment Protection.
   6. Hubbell Incorporated.
   7. O-Z/Gedney; a brand of Emerson Industrial Automation.
   8. RACO; Hubbell.
   9. Robroy Industries.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Metal Floor Boxes:
   1. Material: Cast metal or sheet metal.
   2. Type: Fully adjustable.
   3. Shape: Rectangular.
   4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

K. Gangable boxes are prohibited.

L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, Type 3R, Type 4, or Type 12 with continuous-hinge cover with flush latch unless otherwise indicated.
   1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
   2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

M. Cabinets:
   1. NEMA 250, Type 1, Type 3R, or Type 12 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
   2. Hinged door in front cover with flush latch and concealed hinge.
   3. Key latch to match panelboards.
   4. Metal barriers to separate wiring of different systems and voltage.
   5. Accessory feet where required for freestanding equipment.
   6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed Conduit: GRC, IMC, RNC, Type EPC-80-PVC.
   2. Concealed Conduit, Aboveground: RNC, Type EPC-40-PVC.
   3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried, with concrete encasement under paved areas.
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
   5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed, Not Subject to Physical Damage: EMT.
   2. Exposed and Subject to Physical Damage: GRC or IMC. Raceway locations include the following:
      a. Loading dock.
      b. Storage Rooms.

c. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
d. Mechanical rooms.

3. Concealed in Ceilings and Interior Walls and Partitions: EMT or ENT. ENT may not be used in a return air plenum space.
4. Encased in concrete construction: PVC or ENT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC or IMC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 kitchens and other damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings. Comply with NEMA FB 2.10.
2. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Where nonmetallic conduit enters the building, transition to steel conduit within 6” of the first floor slab or exterior wall.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation to each pull box or enclosure before starting conductor installation. This is not intended to prevent pre-fab work from being completed for installation on the job site as a complete system of raceways, boxes, and wiring.

D. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab. Terminate with a threaded coupling and closure plug set flush with top of finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control and signal conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Conceal raceways within finished walls, ceilings, and floors unless otherwise indicated. Install raceways parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Raceways Embedded in Slabs:
   1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
   2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
   3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
   4. Change from ENT to GRC or IMC before rising above floor.

J. Stub-ups to Above Recessed Ceilings:
   1. Use EMT, IMC, or RMC for raceways.
   2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

M. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

N. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

O. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

P. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

Q. Surface Raceways:
   1. Install surface raceway with a minimum 2-inch radius control at bend points.
   2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

R. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

S. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   2. Where an underground service raceway enters a building or structure.
   3. Where otherwise required by NFPA 70.

T. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

U. Expansion-Joint Fittings:
   1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
   2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
      a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
      b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
      c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
   3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
   4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
   5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific

location at time of installation. Install conduit supports to allow for expansion movement.

V. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
   1. Use LFMC in damp or wet locations.

W. Boxes:
   1. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
   2. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
   3. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
   4. Locate boxes so that cover or plate will not span different building finishes.
   5. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
   6. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
   7. Set metal floor boxes level and flush with finished floor surface.
   8. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:
   1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 31 20 00 "Earth Moving" for pipe less than 6 inches in nominal diameter.
   2. Install backfill as specified in Section 31 20 00 "Earth Moving."
   3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 31 20 00 "Earth Moving."

4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
   a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
   b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
5. Warning Planks: Bury warning planks approximately 12 inches above direct-buried conduits but a minimum of 6 inches below grade. Align planks along centerline of conduit.

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes with bottom below frost line.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 07 84 13 "Penetration Firestopping."

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 26 05 33

SECTION 26 05 44

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
   2. Sleeve-seal systems.
   3. Sleeve-seal fittings.
   4. Grout.
   5. Silicone sealants.

B. Related Requirements:
   1. Section 07 84 13 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Exterior Wall Sleeves:
   1. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Interior wall and Floor Sleeves:
   1. Sleeves may be formed using galvanized steel or PVC sleeving materials.

C. Sleeves for Rectangular Openings:
   1. Material: Galvanized sheet steel.
   2. Minimum Metal Thickness:
      a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.

b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Advance Products & Systems, Inc.
      b. CALPICO, Inc.
      c. Metraflex Company (The).
      d. Pipeline Seal and Insulator, Inc.
   2. Sealing Elements: EPDM or Nitrile (Buna N) rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
   3. Pressure Plates: Carbon steel or Stainless steel.
   4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, or Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
   1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
   1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
      a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07 92 00 "Joint Sealants."
      b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
   2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
   3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
   4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
   5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
   1. Use circular sleeves unless penetration arrangement requires rectangular sleeved opening.
   2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using cast iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 26 05 44

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Identification for raceways.
   2. Identification of power and control cables.
   3. Identification for conductors.
   4. Underground-line warning tape.
   5. Warning labels and signs.
   6. Instruction signs.
   7. Equipment identification labels, including arc-flash warning labels.
   8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

B. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

C. Delegated-Design Submittal: For arc-flash hazard study.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:
   1. Black letters on an orange field.
   2. Legend: Indicate voltage and system or service type.

B. Warning labels and signs shall include, but are not limited to, the following legends:
   1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
   2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR xx INCHES."

2.3 LABELS

A. Self-Adhesive Labels:
   1. Preprinted, 3-mil-thick, polyester or vinyl flexible label with acrylic pressure-sensitive adhesive.
      a. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized to fit the cable or raceway diameter, such that the clear shield overlaps the entire printed legend.
   2. Polyester or Vinyl, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
      a. Nominal Size: 3.5-by-5-inch.
   3. Marker for Tags: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

2.4 BANDS AND TUBES:

A. Snap-Around, Color-Coding Bands for Raceways and Cables: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters of raceways or cables they identify, and that stay in place by gripping action.

B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameters of and shrunk to fit firmly around cables they identify. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.

2.5 TAPES AND STENCILS:

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.

C. Tape and Stencil for Raceways Carrying Circuits 600 V or Less: 4-inch-wide black stripes on 10-inch centers placed diagonally over orange background that extends full length of raceway or duct and is 12 inches wide. Stop stripes at legends.

D. Underground-Line Warning Tape
   1. Tape:
      a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
      b. Printing on tape shall be permanent and shall not be damaged by burial operations.
      c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
   2. Color and Printing:
      a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
      b. Inscriptions for Red-Colored Tapes: "BURIED ELECTRIC LINE".
      c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE", "COMMUNICATIONS CABLE", or "OPTICAL FIBER CABLE".

2.6 TAGS

A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

B. Write-On Tags:
   1. Polyester Tags: 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to raceway, conductor, or cable.
   2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 SIGNS

A. Baked-Enamel Signs:
   1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
   2. 1/4-inch grommets in corners for mounting.
   3. Nominal Size: 7 by 10 inches.

B. Laminated Acrylic or Melamine Plastic Signs:
   1. Engraved legend.
   2. Thickness:
      a. For signs up to 20 sq. inches, minimum 1/16-inch-.
      b. For signs larger than 20 sq. inches, 1/8 inch thick.
      c. Engraved legend with black letters on white face.
      d. Punched or drilled for mechanical fasteners.
      e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
   1. Minimum Width: 3/16 inch.
   2. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi.
   3. Temperature Range: Minus 40 to plus 185 deg F.
   4. Color: Black, except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
   1. Minimum Width: 3/16 inch.
   2. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi.
   3. Temperature Range: Minus 40 to plus 185 deg F.
   4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, self-locking.
   1. Minimum Width: 3/16 inch.
   2. Tensile Strength at 73 deg F according to ASTM D 638: 7000 psi.
   3. UL 94 Flame Rating: 94V-0.
   4. Temperature Range: Minus 50 to plus 284 deg F.
   5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

G. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
   1. Outdoors: UV-stabilized nylon.
   2. In Spaces Handling Environmental Air: Plenum rated.

H. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

I. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

J. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

K. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box with system/circuit designation and system voltage.

L. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
   1. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.
      a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
      b. Colors for 208Y/120-V Circuits:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
      c. Colors for 480Y/277-V Circuits:
         1) Phase A: Brown.
         2) Phase B: Orange.
         3) Phase C: Yellow.
      d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

M. Install instructional sign, including the color code for grounded and ungrounded conductors using adhesive-film-type labels.

N. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive, self-laminating polyester or vinyl labels with the conductor or cable designation, origin, and destination.

O. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive, self-laminating polyester or vinyl labels with the conductor designation.

P. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
   1. Install underground-line warning tape for direct-buried cables and cables in raceways.

Q. Arc Flash Warning Labeling: Self-adhesive thermal transfer vinyl labels.
   1. Comply with NFPA 70E and ANSI Z535.4.
   2. Comply with Section 260574 "Overcurrent Protective Device Arc-Flash Study" requirements for arc-flash warning labels.

R. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

S. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm unless equipment is provided with its own identification.
   1. Labeling Instructions:
      a. Indoor Equipment: Engraved, laminated acrylic or melamine plastic label. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
      b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
      c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
      d. Unless labels are provided with self-adhesive means of attachment, fasten them with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
   2. Equipment To Be Labeled:
      a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a engraved, laminated acrylic or melamine label.
      b. Enclosures and electrical cabinets.
      c. Access doors and panels for concealed electrical items.
      d. Switchboards.
      e. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
      f. Enclosed switches.
      g. Enclosed circuit breakers.
      h. Enclosed controllers.
      i. Variable-speed controllers.
      j. Push-button stations.

END OF SECTION 26 05 53

SECTION 26 05 73

FAULT CURRENT, COORDINATION, AND ARC FLASH STUDIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes computer-based, fault-current, overcurrent protective device coordination, and arc flash studies. Protective devices shall be set based on results of the final protective device coordination study. Equipment shall be rated to a minimum of the computed available fault current.

B. This Study is part of the Contract. However, the required expertise and qualifications will require that a 3rd party Specialist be hired by the Contractor. The Specialist may be a division of the distribution equipment Manufacturer used on the project.

1.3 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: The following submittals shall be made after the selection process for system protective devices has been completed. Submittals may be in digital form.
   1. Preliminary Fault Current Study and Equipment Evaluation Report shall be submitted with the shop drawings for all electrical distribution equipment.
   2. Final fault current, coordination, and arc flash studies.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For coordination-study specialist. All work related to the study shall be done under the direct supervision of the specialist. Specialist shall be an Engineer licensed in the state/District of Columbia where the construction is being performed. Provide copy of Specialist's license. Specialist shall have at least 5 years of experience with similar studies. Submit list of studies performed. Submit references, upon request.

B. Product Certificates: For coordination study, fault-current study, and arc flash study computer software programs, certifying compliance with IEEE 399.

1.5 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are not acceptable.

B. Coordination-Study Specialist Qualifications: An entity experienced in the application of computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
   1. Professional engineer, licensed in the state where Project is located, shall be responsible for the study. All elements of the study shall be performed under the direct supervision and control of County's Representative.

C. Comply with IEEE 242 for short-circuit currents and coordination time intervals.

D. Comply with IEEE 399 for general study procedures.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Available Computer Software Developers: Subject to compliance with requirements, companies offering computer software programs that may be used in the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide A-Fault by SKM Systems Analysis, Inc., or a comparable product by one of the following:
   1. CGI CYME.
   2. EDSA Micro Corporation.
   3. ESA Inc.
   4. Operation Technology, Inc.

2.2 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

A. Comply with IEEE 399.

B. Analytical features of fault-current-study computer software program shall include "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.
   1. Features:
      a. ANSI short circuit study.

b. Arc flash study and determine PPE for each piece of equipment (excluding loadcenters).

D. All new and existing distribution equipment related to the project shall be evaluated, including a representation of upstream equipment of the utility company. Evaluate all equipment with "Pass" or "Fail". Studies not providing a definitive conclusion of adequacy of individual pieces of equipment are not acceptable. A "Pass" shall mean that, in the Specialist's professional opinion, the intended equipment meets each of the required criteria being evaluated for a proper installation:

1. The fault current rating of the equipment is adequate for the calculated available fault current. Any safety factors deemed necessary by the Specialist shall be taken into consideration, including any industry accepted manufacturing tolerances of transformers and shall consider reasonable expected upgrades to the utility network.
2. Coordination of overcurrent protective devices.
   a. Emergency distribution system equipment shall be fully rated and coordinated as required by code.
   b. Normal power coordination shall be to industry standards. It is understood that in some conditions, there can be a trade-off between safety and complete coordination of instantaneous (bolted fault) conditions. In no way is the contract intent to increase arc flash potential to dangerous levels, or add unnecessarily long time delays, beyond what is necessary for industry accepted device coordination of normal power overcurrent protective devices.
3. Arc Flash PPE category. The Specialist shall take arc flash ratings into consideration when determining overcurrent protection settings. The Specialist, in his professional judgment, shall take care not to introduce arbitrarily excessive time delays that result in excessively high arc flash conditions.

E. It is critical that the Specialist work with the Contractor and his equipment supplier to insure that the actual equipment supplied, is the same equipment used in the Study, and that the preliminary fault current study and equipment shop drawings have been accepted prior to equipment being shipped to the site. The Study should begin as soon as possible in the project schedule. Although coordinating the equipment with the study falls under the single-point responsibility of the Contractor, it is suggested that the following process occur between the Contractor and the Specialist (his SubContractor):

1. Contractor shall provide data on project conditions to the Specialist. This includes:
   a. All equipment locations.
   b. Contract documents including any deviations from same.
   c. All conductor sizes, types, and lengths, and conduit material. This includes any deviations from the contract documents (for example, using #2 AWG conductors in lieu of #3 AWG).
   d. Preliminary "shop drawings" and/or list of distribution equipment to be used.
2. Specialist shall provide the preliminary fault current study and equipment evaluation report to the Contractor for submission as a shop drawing. This

preliminary submittal should accompany shop drawings for distribution equipment. Specialist shall provide interrupting rating requirements to Contractor and confirm to the Contractor that intended overcurrent devices have adequate features available for coordination. Specialist shall suggest to the Contractor alternative breakers, trip units, etc. as required.

3. Contractor shall submit distribution equipment meeting the requirements of the study.
4. Specialist shall provide assistance to the Contractor with breaker settings. Specialist shall provide Arc Flash Hazard Labels to the Contractor for installation on equipment.

F. Although the Contractor may, at his option, have the distribution equipment and Study submittals reviewed concurrently, this in no way alleviates his responsibility for coordination between the two. The Contractor shall be responsible for any delays or equipment replacement incurred due to submission delays of the Study.

G. The Specialist and/or Contractor shall work with the Utility Company, or their representative, to determine the available fault current at the project site.

H. All assumptions, input data, and utility contribution letter shall be included in the Study. Format Study to avoid repetitive information and calculation tables. Where clearly identified and appropriate, identical/similar conditions can be representative of one typical/worst case area studied.

I. Provide a 1-Line diagram of entire distribution system studied, with all equipment labeled. Provide calculated fault current labels at each piece of equipment.

J. Provide Time Current Curves of each condition, of each distribution system, to the extent required to demonstrate coordination. All worst case conditions shall be represented at a minimum.

K. State all assumptions and reasoning used in an Introduction within the Study. Provide a Conclusion within the Study that summarized the evaluation and specifies any problems and shortcomings found.

L. Make suggestions on how to rectify all equipment that does not pass. Work with the Contractor and County's Representative and suggest a course of action to remedy all failing equipment. Revise Study until all equipment has achieved a passing score. Additional revisions and submissions of the Study due to poor coordination between the Contractor and the Specialist shall be the burden of the Contractor.

M. Where the Contract Documents list fault current ratings, this is intended as an estimation only. The Study shall evaluate all equipment related to the project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.
   1. Submit Study only after relevant equipment selections have been assembled. If equipment is submitted prior to the study, then approvals will be contingent on meeting requirements of the study. Make revisions to all equipment and ratings, trip units, and overcurrent devices as required to meet the requirements of the Study.

3.2 POWER SYSTEM DATA

A. Gather and tabulate the following input data to support coordination study:
   1. Product Data for overcurrent protective devices specified in other electrical Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
   2. Impedance of utility service entrance.
   3. Electrical Distribution System Diagram: In hard-copy and electronic-copy formats, showing the following:
      a. Circuit-breaker and fuse-current ratings and types.
      b. Relays and associated power and current transformer ratings and ratios.
      c. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, and X/R ratios.
      d. Generator kilovolt amperes, size, voltage, and source impedance.
      e. Cables: Indicate conduit material, sizes of conductors, conductor material, insulation, and length.
      f. Busway ampacity and impedance.
      g. Motor horsepower and code letter designation according to NEMA MG 1.
   4. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:
      a. Special load considerations, including starting inrush currents and frequent starting and stopping.
      b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
      c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
      d. Generator thermal-damage curve.
      e. Ratings, types, and settings of utility company's overcurrent protective devices.
      f. Special overcurrent protective device settings or types stipulated by utility company.

g. Time-current-characteristic curves of devices indicated to be coordinated.
h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
j. Panelboards, switchboards, motor-control center ampacity, and interrupting rating in amperes rms symmetrical.

3.3 FAULT-CURRENT STUDY

A. Calculate the maximum available fault current in amperes rms symmetrical at circuit-breaker positions of the electrical power distribution system. The calculation shall be for a current immediately after initiation and for a three-phase bolted short circuit at each of the following:
   1. Switchboard bus.
   2. Group Metering.
   3. Automatic Transfer Switch.
   4. Distribution panelboard.
   5. Branch circuit panelboard.

B. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions.

C. Calculate momentary and interrupting duties on the basis of maximum available fault current.

D. Calculations to verify interrupting ratings of overcurrent protective devices shall comply with IEEE 241 and IEEE 242.
   1. Transformers:
      a. ANSI C57.12.10.
      b. ANSI C57.12.22.
      c. ANSI C57.12.40.
      d. IEEE C57.12.00.
      e. IEEE C57.96.
   2. Medium-Voltage Circuit Breakers: IEEE C37.010.
   3. Low-Voltage Circuit Breakers: IEEE 1015 and IEEE C37.20.1.
   4. Low-Voltage Fuses: IEEE C37.46.

E. Study Report:
   1. Show calculated X/R ratios and equipment interrupting rating (1/2-cycle) fault currents on electrical distribution system diagram.

F. Equipment Evaluation Report:
   1. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
   2. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
   3. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

3.4 COORDINATION STUDY

A. Perform coordination study using approved computer software program. Prepare a written report using results of fault-current study. Comply with IEEE 399.
   1. Calculate the maximum and minimum 1/2-cycle short-circuit currents.
   2. Calculate the maximum and minimum ground-fault currents.

B. Comply with IEEE 241 & IEEE 242 recommendations for fault currents and time intervals.

C. Transformer Primary Overcurrent Protective Devices:
   1. Device shall not operate in response to the following:
      a. Inrush current when first energized.
      b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
      c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.
   2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

D. Motors served by voltages more than 600 V shall be protected according to IEEE 620.

E. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

F. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:
   1. Tabular Format of Settings Selected for Overcurrent Protective Devices:
      a. Device tag.

b. Relay-current transformer ratios; and tap, time-dial, and instantaneous-pickup values.
c. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.
d. Fuse-current rating and type.
e. Ground-fault relay-pickup and time-delay settings.

2. Coordination Curves: Prepared to determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:
   a. Device tag.
   b. Voltage and current ratio for curves.
   c. Three-phase and single-phase damage points for each transformer.
   d. No damage, melting, and clearing curves for fuses.
   e. Cable damage curves.
   f. Transformer inrush points.
   g. Maximum fault-current cutoff point.

G. Completed data sheets for setting of overcurrent protective devices.

3.5 ARC FLASH STUDY

A. Provide label on each piece of distribution equipment indicating the available energy and the level of PPE required to be worn for safe operation.

B. Provide scenarios for both maximum and minimum fault current as applicable. Base arc flash based on worst case.

END OF SECTION 26 05 73

SECTION 26 08 00

COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The purpose of this section is to specify Division 26 responsibilities in the commissioning process which are being directed by the Commissioning Authority (CA). The commissioning requirements designated in this section pertain to building commissioning activities and documentation in support of Calgreen 2013 standards.

B. The systems to be commissioned are listed in Section 01 91 13. Contractors MUST refer to section 01 91 13 for this and other commissioning information. Electrical Systems Commissioning section does not replace the contents of the 01 91 13 and all parties will be held to the information contained in both sections.

C. Commissioning (Cx) requires the participation of Division 26 to ensure that all systems are operating in a manner consistent with the Contract Documents through documented functional testing and startup procedures. The general commissioning requirements and coordination are detailed in Division 01. Division 26 shall be familiar with all parts of Division 01 and the Commissioning Plan issued by the Commissioning Authority (CA) and shall execute all Cx responsibilities assigned to them in the Contract Documents.

1.2 RELATED SECTIONS

A. Section 01 91 13- General Commissioning Requirements

B. Division 26 Section “Inspections and Testing for Electrical Work”

1.3 RESPONSIBILITIES

A. Electrical Contractors. The Cx responsibilities applicable to each of the electrical, and controls contractors of Division 26 are as follows (all references apply to commissioned equipment only, summarized activities here, review 01 91 13 for all responsibilities):
   1. Include and itemize the cost of Cx, including functional testing, documentation, and all specified requirements in the contract price.
   2. Attend a Cx scoping meeting and other meetings necessary to facilitate the Cx process.
   3. Contractors shall provide the CA with normal cut sheets and shop drawing submittals of commissioned equipment.
   4. Provide additional requested documentation, prior to normal O&M manual submittals, to the CA for development of functional testing procedures.
      a. This shall include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any County-

contracted tests, full factory testing reports, if any, and full warranty information, including all responsibilities of the County to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CA.

b. The CA may request further documentation necessary for the commissioning process, and requests may be made prior to normal submittals.

5. Provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review and approval. Refer to section 01 91 13 section 3.7 (F) for document contents and format requirements.
6. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
7. Provide assistance to the CA in preparing the specific functional performance test procedures. Contractors shall review test procedures to ensure feasibility, safety, acceptability under warranty requirements, equipment protection and provide necessary written alarm limits to be used during the tests.
8. During the startup and initial checkout process, execute the pre-functional checklists for all commissioned equipment and return to the CA.
9. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA for inclusion in the Commissioning Report.
10. Provide written responses, in a timely manner, to all items noted in the Cx submittal review and Cx issues log that relate to Division 26.
11. Address current County Representative punch list items before the commencement of functional testing.
12. Provide skilled technicians to execute starting of equipment and to rehearse and execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and allngi resultant problem-solving.
13. Provide skilled technicians to perform functional performance testing under the direction of the CA for specified equipment. This assumes that the controls contractor has rehearsed the functional tests and corrected system (or identified and informed the CA of test procedure) discrepancies from design prior to the verification tests. Assist the CA in interpreting the monitoring data, as necessary.
14. Correct any deficiencies (differences between specified and observed performance) as interpreted by the CA, CMGC Commissioning Coordinator and A/E; retest the equipment. Note contractor may be responsible for the cost of retesting if there are excessive test failures; see Section 01 91 13, Part 3.5.
15. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions. Refer to section 01 78 00 for document contents and format requirements.
16. During construction, maintain as-built red-line drawings for all drawings and final CAD as-built for contractor-generated coordination drawings. Provide to CA as

requested for functional test development and update after completion of commissioning (excluding deferred testing and seasonal testing).

17. Provide training of the County's operating staff using expert qualified personnel, as specified.
18. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
19. Warranty Period
    a. Assist CA in execution of select seasonal or deferred functional performance testing.
    b. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Division 26 shall provide all test equipment necessary to fulfill the testing requirements of this Division. Refer to 01 91 13.

PART 3 - EXECUTION

3.1 COMMISSIONING PROCESS AND PROCEDURES

A. Refer to 01 91 13 for General Commissioning Process and Procedures.

3.2 PRE-FUNCTIONAL CHECKLISTS

A. Electrical and controls contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this specification. Division 26 contractors have start-up responsibility and are required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures do not relieve or lessen this responsibility or shift that responsibility partially to the CA or County.

B. Review and Complete Pre-functional Readiness Checklists in accordance with Section 01 91 13

C. CMGC Commissioning Coordinator shall verify completion of all items, sign and return the checklist to the Commissioning Authority as an indication of final completion with all installation criteria as specified in the Project Contract Documents

D. A separate completed checklist shall be submitted for each system and item of equipment within the commissioning scope of work, as specified in 01 91 13.

E. The Pre-Functional Checklists do not represent all the contract documents for the associated equipment. Completion of the items on this checklist does not release the contractor from requirements specified elsewhere.

3.3 FUNCTIONAL PERFORMANCE TESTING

A. The Functional Performance Test (FPT) Procedures shall be developed, performed, and demonstrated in accordance with Section 01 91 13.

B. Contractor is responsible for conducting test runs of all required Functional Performance Tests, and submit results to the CA prior to the Commissioning Authority witnessed Functional Testing. See Section 01 91 13 – Section 3.2.

C. The CMGC's Commissioning Coordinator shall coordinate the subcontractors, with the Commissioning Authority's input, in developing, performing, and demonstrating the Working FPT.

D. Functional testing shall consist of the following four phases:
   1. Component testing:
      a. Component testing applies to all control input and output devices, including those provided by the equipment suppliers and those provided with the Building Automation System (BAS). Examples include but are not limited to: sensor assemblies, detectors, relays and switches, valves, dampers, and actuators.
   2. Systems Testing; Operational Verification: After functional testing of the system components has been successfully completed, each sequence of operation and control system function shall be functionally tested, including those provided by the equipment suppliers and those provided with the Building Automation System (BAS). Each control loop shall be tested to verify stable control with the specified and appropriate responses. Testing may include examination of trended data for any point, even where not explicitly called out in functional test script.
   3. Systems Testing - Integrated System Verification: After operational testing has successfully demonstrated that each system functions in accordance with the project documents, functional testing shall occur to verify that the interaction between the systems is as required. Each interactive function shall be functionally tested, including those provided by the equipment suppliers and those provided with the BAS.
   4. Systems Testing - Real Time Performance Analysis (trend logging):
      a. After operational testing has been successfully completed real time performance testing shall be performed. Data shall be logged for the intervals and periods specified in the FPT procedures. Unless otherwise specified in the FPTs, test periods shall include occupied, unoccupied, weekday and weekend schedules.
      b. All points shall be trended, initiated at the end of construction, continuing over the entire commissioning period and left in place for future use or seasonal commissioning. All points shall be simultaneously trended at intervals per the CA discretion. Historical archiving shall be enabled so that data is continuous with no gaps and accessible in the future. The data shall be capable of being stored at a minimum of 1 year period.
      c. Internet or web-based remote access shall be provided to the commissioning agent for the commissioning period. Trends shall be displayed graphically

and shall be user configurable at the graphical interface. Graphical displays shall be capable of containing multiple points on a single graph.

d. Analysis of the data shall demonstrate that that the systems operate in accordance with the acceptance criteria specified in the FPT procedures. Verify that data demonstrates acceptable results before submitting for CA review. If acceptable results are not demonstrated, perform testing and trouble shooting and corrective action to provide resolution. Provisions for retesting, as specified in 01 91 13 shall apply to trend log analysis.
e. In addition to the initial test period, data logged during a peak heating period, a peak cooling period, and a transitional season period if required by the CA.

3.4 ISSUE CORRECTION

A. Refer to Section 01 91 13 – Part 3.5 for details on issue resolution.

3.5 OPERATION AND MAINTENANCE (O&M) MANUALS

A. Refer to Section 01 91 13 – Part 3.7

3.6 TRAINING OF COUNTY PERSONNEL

A. Refer to Section 01 91 13 – Part 3.

END OF SECTION 26 08 00

SECTION 26 09 13

ELECTRICAL POWER MONITORING AND CONTROL

PART 1 - GENERAL

1.1 FUNCTIONAL DESCRIPTION

A. Instrumentation and Recording Devices: Monitor and record load profiles and chart energy consumption patterns for purpose of LEED Measurement and Verification.
   1. Calculate and Record the Following:
      a. Load factor.
      b. Peak demand periods.
      c. Separate consumption correlated with load types.
   2. Measure and Record Metering Data for the Following:
      a. Electricity kWH and Demand.

B. Software: Calculate allocation of utility costs.
   1. Automatically Record Energy Usage Records to Allocate Energy Costs for the Following:
      a. Total Electric Service (sum of two main switches).
      b. Lighting.
      c. Mechanical Equipment.
      d. Plug Loads.
      e. Tenant Loads (Level 1)
   2. Verify utility bills and analyze alternate energy rates.

1.2 SYSTEM REQUIREMENTS

A. Monitoring and Control System: Coordinate any new components being provided under this contract with monitoring and control system provided for the core and shell building. Provide any additional programming and setup specifically require to incorporate tenant systems.

B. Addressable Devices: All transmitters and receivers shall communicate unique device identification and status reports to monitoring and control clients.

C. BAS Interface: Utilize hardware and software to enable the local BAS to monitor, display, and record data for use in processing reports.
   1. Hardwired Monitoring Points: Electrical power demand (kilowatts), electrical power consumption (kilowatt-hours), power factor.
   2. ASHRAE 135 (BACnet) or mutually agreeable, industry-accepted, open-protocol communication interface with the BAS shall enable the BAS operator to remotely monitor meter information from a BAS operator workstation. Control features and monitoring points displayed locally at metering panel shall be available through the BAS.

1.3 OPERATING SYSTEM

A. Software: Configured to run on a single PC, with capability for accessing multiple devices simultaneously. Modbus TCP/IP, RS-232, and RS-485 digital communications.

B. Operating System Software: Based on 32 or 64-bit, Microsoft Windows workstation operating system. Software shall have the following features:
   1. Multiuser and multitasking to allow independent activities and monitoring to occur simultaneously at different workstations.
   2. Graphical user interface to show pull-down menus and a menu tree format.
   3. Capability for future additions within the indicated system size limits.

1.4 APPLICATIONS SOFTWARE

A. Basic Requirements:
   1. Fully compatible with and based on the approved operating system.
   2. Password-protected operator login and access; three levels, minimum.
   3. Password-protected setup functions.
   4. Context sensitive on-line help.
   5. Capability of creating, deleting, and copying files; and automatically maintaining a directory of all files, including size and location of each sequential and random-ordered record.
   6. Capability for importing custom icons into graphic views to represent alarms and I/O devices.
   7. Automatic and encrypted backups for database and history; automatically stored at selected workstation and encrypted with a nine-character alphanumeric password, which must be used to restore or read data contained in backup.
   8. Operator audit trail for recording and reporting all changes made to user-defined system options.

B. Workstation Server Functions:
   1. Support other client PCs on the LAN and WAN.
   2. Maintain recorded data in databases accessible from other PCs on the LAN and WAN.

C. Data Formats:
   1. User-programmable export and import of data to and from commonly used Microsoft Windows spreadsheet, database, billing, and other applications; using dynamic data exchange technology.
   2. Option to convert reports and graphics to HTML format.
   3. Interactive graphics.
   4. Option to send preprogrammed or operator designed e-mail reports.

D. Metered Data: Display metered values in real time.

E. Remote Control:
   1. Display circuit-breaker status and allow breaker control.

F. Equipment Documentation: Database for recording of equipment ratings and characteristics; with capability for graphic display on monitors.

G. Graphics: Interactive color-graphics platform with pull-down menus and mouse-driven generation of power system graphics, in formats widely used for such drafting; to include the following:
   1. Site plan.
   2. Floor plans.
   3. Equipment elevations.
   4. Single-line diagrams.

H. User-Defined Monitoring and Control Events: Display and record with date and time stamps accurate to 0.1 second, and including the following:
   1. Operator log on/off.
   2. Attempted operator log on/off.
   3. All alarms.
   4. Equipment operation counters.
   5. Out-of-limit, pickup, trip, and no-response events.

I. Trending Reports: Display data acquired in real-time from different meters or devices, in historical format over user-defined time; unlimited as to interval, duration, or quantity of trends.
   1. Spreadsheet functions of sum, delta, percent, average, mean, standard deviation, and related functions applied to recorded data.
   2. Charting, statistical, and display functions of standard Windows-based spreadsheet.

J. Alarms: Display and record alarm messages from discrete input and controls outputs, according to user programmable protocol.
   1. Functions requiring user acknowledgment shall run in background during computer use for other applications and override other presentations when they occur.

K. Data Sharing: Allow export of recorded displays and tabular data to third-party applications software.

L. Tenant or Activity Billing Software (for level 1 tenants only):
   1. Automatically compute and prepare activity demand and energy-use statements based on metering of energy use and peak demand integrated over user-defined interval.
   2. Intervals shall be same as used by electric utilities, including current vendor.
   3. Import metered data from saved records that were generated by metering and monitoring software.
   4. Maintain separate directory for each tenant's historical billing information.

5. Prepare summary reports in user-defined formats and time intervals.

M. Reporting: User commands initiate the reporting of a list of current alarm, supervisory, and trouble conditions in system or a log of past events.
   1. Print a record of user-defined alarm, supervisory, and trouble events on workstation printer.
   2. Sort and report by device name and by function.
   3. Report type of signal (alarm, supervisory, or trouble), description, date, and time of occurrence.
   4. Differentiate alarm signals from other indications.
   5. When system is reset, report reset event with same information concerning device, location, date, and time.

1.5 COMMUNICATION COMPONENTS AND NETWORKS

A. Transient Voltage Surge Suppression and Electromagnetic-Interference Immunity: Include in solid-state equipment. Comply with IEEE C37.90.

B. Network Configuration: High-speed, multi-access, open nonproprietary, industry standard communication protocol; LANs complying with EIA 485, 100 Base-T Ethernet, and Modbus TCP/IP.

1.6 POWER MONITORS

A. Separately mounted, permanently installed instrument for power monitoring and control.
   1. Enclosure: NEMA 250, Type 1.

B. Environmental Conditions: System components shall be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
   1. Indoor installation in nontemperature-controlled spaces that have environmental controls to maintain ambient conditions of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and 20 to 90 percent relative humidity, noncondensing.

C. RMS Real-Time Measurements:
   1. Current: Each phase, neutral, average of three phases, percent unbalance.
   2. Voltage: Line-to-line each phase, line-to-line average of three phases, line-to-neutral each phase, line-to-neutral average of three phases, line-to-neutral percent unbalance.
   3. Power: Per phase and three-phase total.
   4. Reactive Power: Per phase and three-phase total.
   5. Apparent Power: Per phase and three-phase total.
   6. Power Factor: Per phase and three-phase total.
   7. Frequency.

D. Demand Current Calculations, per Phase, Three-Phase Average and Neutral:
   1. Present.
   2. Running average.
   3. Last completed interval.
   4. Peak.

E. Demand Real Power Calculations, Three-Phase Total:
   1. Present.
   2. Running average.
   3. Last completed interval.
   4. Predicted.
   5. Peak.
   6. Coincident with peak kVA demand.
   7. Coincident with kVAR demand.

F. Demand Reactive Power Calculations, Three-Phase Total:
   1. Present.
   2. Running average.
   3. Last completed interval.
   4. Predicted.
   5. Peak.
   6. Coincident with peak kVA demand.
   7. Coincident with kVAR demand.

G. Demand Apparent Power Calculations, Three-Phase Total:
   1. Present.
   2. Running average.
   3. Last completed interval.
   4. Predicted.
   5. Peak.
   6. Coincident with peak kVA demand.
   7. Coincident with kVAR demand.

H. Average Power Factor Calculations, Demand Coincident, Three-Phase Total:
   1. Last completed interval.
   2. Coincident with kW peak.
   3. Coincident with kVAR peak.
   4. Coincident with kVA peak.

I. Power Analysis Values:
   1. THD, Voltage and Current: Per phase, three phase, and neutral.
   2. Displacement Power Factor: Per phase, three phase.
   3. Fundamental Voltage, Magnitude and Angle: Per phase.
   4. Fundamental Currents, Magnitude and Angle: Per phase.
   5. Fundamental Real Power: Per phase, three phase.
   6. Fundamental Reactive Power: Per phase.

7. Phase rotation.
8. Unbalance: Current and voltage.

J. Power Demand Calculations: According to one of the following calculation methods, selectable by the user:
   1. Thermal Demand: Sliding window updated every second for the present demand and at end of the interval for the last interval. Adjustable window that can be set in 1-minute intervals, from 1 to 60 minutes.

K. Minimum and Maximum Values: Record monthly minimum and maximum values, including date and time of record. For three-phase measurements, identify phase of recorded value. Record the following parameters:
   1. Line-to-line voltage.
   2. Line-to-neutral voltage.
   3. Current per phase.
   4. Line-to-line voltage unbalance.
   5. Line-to-neutral voltage unbalance.
   6. Power factor.
   7. Displacement power factor.
   8. Total power.
   9. Total reactive power.
   10. Total apparent power.
   11. Frequency.

L. Current and Voltage Ratings:
   1. Designed for use with current inputs from standard instrument current transformers with 5-A secondary and shall have a metering range of 0-10 A.
   2. Withstand ratings shall be not less than 15 A, continuous; 50 A, lasting over 10 seconds, no more frequently than once per hour; 500 A, lasting 1 second, no more frequently than once per hour.
   3. Designed for use with voltage inputs from standard instrument potential transformers with a 120-V secondary.

M. Accuracy:
   1. Comply with ANSI C12.20, Class 0.5; and IEC 60687, Class 0.5 for revenue meters.
   2. Accuracy from Light to Full Rating:
      a. Power: Accurate to 0.25 percent of reading, plus 0.025 percent of full scale.
      b. Voltage and Current: Accurate to 0.075 percent of reading, plus 0.025 percent of full scale.
      c. Power Factor: Plus or minus 0.002, from 0.5 leading to 0.5 lagging.
      d. Frequency: Plus or minus 0.01 Hz at 45 to 67 Hz.

N. Input: One digital input signal(s).
   1. Normal mode for on/off signal.

2. Demand interval synchronization pulse, accepting a demand synchronization pulse from a utility demand meter.
3. Conditional energy signal to control conditional energy accumulation.

O. Outputs:
1. Operated either by user command sent via communication link, or set to operate in response to user-defined alarm or event.
2. Closed in either a momentary or latched mode as defined by user.
3. Each output relay used in a momentary contact mode shall have an independent timer that can be set by user.
4. One digital KY pulse to a user-definable increment of energy measurement. Output ratings shall be up to 120-V ac, 300-V dc, 50 mA, and provide 3500-V rms isolation.
5. One relay output module(s), providing a load voltage range from 20- to 240-V ac or from 20- to 30-V dc, supporting a load current of 2 A.
6. Output Relay Control:
   a. Relay outputs shall operate either by user command sent via communication link or in response to user-defined alarm or event.
   b. Normally open and normally closed contacts, field configured to operate as follows:
      1) Normal contact closure where contacts change state for as long as signal exists.
      2) Latched mode when contacts change state on receipts of a pickup signal; changed state is held until a dropout signal is received.
      3) Timed mode when contacts change state on receipt of a pickup signal; changed state is held for a preprogrammed duration.
      4) End of power demand interval when relay operates as synchronization pulse for other devices.
      5) Energy Pulse Output: Relay pulses quantities used for absolute kWh, absolute kVARh, kVAh, kWh In, kVARh In, kWh Out, and kVARh Out.
      6) Output controlled by multiple alarms using Boolean-type logic.

P. Onboard Data Logging:
1. Store logged data, alarms, events, and waveforms in 80 KB of onboard nonvolatile memory.
2. Stored Data:
   a. Billing Log: User configurable; data shall be recorded every 15 minutes, identified by month, day, and 15-minute interval. Accumulate 24 months of monthly data, 32 days of daily data, and between 2 to 52 days of 15-minute interval data, depending on number of quantities selected.
   b. Custom Data Logs: User-defined log(s) holding up to 96 parameters. Date and time stamp each entry to the second and include the following user definitions:
      1) Schedule interval.
      2) Event definition.
      3) Configured as "fill-and-hold" or "circular, first-in first-out."

c. Alarm Log: Include time, date, event information, and coincident information for each defined alarm or event.
d. Waveform Log: Store captured waveforms configured as "fill-and-hold" or "circular, first-in first-out."

3. Default values for all logs shall be initially set at factory, with logging to begin on device power up.

Q. Alarms.
1. User Options:
a. Define pickup, dropout, and delay.
b. Assign one of four severity levels to make it easier for user to respond to the most important events first.
c. Allow for combining up to four alarms using Boolean-type logic statements for outputting a single alarm.
2. Alarm Events:
a. Over/undercurrent.
b. Over/undervoltage.
c. Current imbalance.
d. Phase loss, current.
e. Phase loss, voltage.
f. Voltage imbalance.
g. Over kW demand.
h. Phase reversal.
i. Digital input off/on.
j. End of incremental energy interval.
k. End of demand interval.

R. Control Power: 90- to 457-V ac or 100- to 300-V dc.

S. Communications:
1. Power monitor shall be permanently connected to communicate via Modbus TCP via a 100 Base-T Ethernet.
2. Local plug-in connections shall be for RS-232 and 100 Base-T Ethernet.

T. Display Monitor:
1. Backlighted LCD to display metered data with touch-pad selecting device.
2. Touch-screen display shall be a minimum 12-inch diagonal, resolution of 800 by 600 RGB pixels, 256 colors; NEMA 250, Type 1 display enclosure.
3. Display four values on one screen at same time.
a. Current, per phase rms, three-phase average and neutral.
b. Voltage, phase to phase, phase to neutral, and three-phase averages of phase to phase and phase to neutral.
c. Real power, per phase and three-phase total.
d. Reactive power, per phase and three-phase total.
e. Apparent power, per phase and three-phase total.
f. Power factor, per phase and three-phase total.

g. Frequency.
h. Demand current, per phase and three-phase average.
i. Demand real power, three-phase total.
j. Demand apparent power, three-phase total.
k. Accumulated energy (MWh and MVARh).
l. THD, current and voltage, per phase.

4. Reset: Allow reset of the following parameters at the display:
   a. Peak demand current.
   b. Peak demand power (kW) and peak demand apparent power (kVA).
   c. Energy (MWh) and reactive energy (MVARh).

1.7 LAN CABLES

A. Comply with Division 27 Section "Communications Horizontal Cabling."

B. RS-485 Cable:
   1. PVC-Jacketed, RS-485 Cable: Paired, 2 pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, PVC insulation, unshielded, PVC jacket, and NFPA 70 - 2008, Type CMG.
   2. Plenum-Type, RS-485 Cable: Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and fluorinated-ethylene-propylene jacket, and NFPA 70 - 2008, Type CMP.

C. Unshielded Twisted Pair Cables: Category 6 as specified for horizontal cable for data service in Division 27 Section "Communications Horizontal Cabling."

1.8 LOW-VOLTAGE WIRING

A. Low-Voltage Control Cable: Multiple conductor, color-coded, No. 20 AWG copper, minimum.
   1. Sheath: PVC; except in plenum-type spaces, use sheath listed for plenums.
   2. Ordinary Switching Circuits: Three conductors, unless otherwise indicated.
   3. Switching Circuits with Pilot Lights or Locator Feature: Five conductors, unless otherwise indicated.

PART 2 - EXECUTION

2.1 COMMISSIONING REQUIREMENTS

A. The Contractor is to include commissioning of the system as a part of his contract obligations. This includes ensuring that the approved equipment is:

B. Installed in accordance with the specification requirements and the manufacturer's written installation instructions.

C. Started, tested, adjusted and balanced to perform in accordance with the specified and approved conditions.
   1. System Testing:
      a. Provide all necessary labor, materials and equipment to successfully complete all system testing necessary for building occupancy and County acceptance.
      b. Provide all necessary labor, materials and equipment to assist Contractors of other division to complete system testing necessary for building occupancy and County acceptance, wherever an inter-relationship between Division 26 and the work of other divisions exists.
      c. Tests shall be repeated as necessary until all occupancy and operation permits are granted and the County accepts the project.

D. Provide material and labor to perform start-up of each respective item of equipment and system prior to beginning of test, adjust and balance procedures.
   1. Provide labor to assist the County's Representative in acceptance review.
   2. Provide point-by-point system checkout. Submit results in tabulated form by system. Include this data as part of Operation and Maintenance Manuals.
   3. Provide information and assistance and cooperate with test, adjust and balance services.
   4. Comply strictly with manufacturer's recommended procedures in starting up mechanical systems.
   5. Provide such periodic continuing adjustment services as necessary to ensure proper functioning of mechanical systems until acceptance and up to 1 full year after date of County acceptance.

E. The Contractor is to include training of the County's operators and providing written operation and maintenance instructions as specified.
   1. Training of County's Operators:
      a. The County shall be given comprehensive training in the understanding of the systems and the operation and maintenance of each major piece of equipment.
      b. The Contractor shall be responsible for scheduling the training which shall start with classroom sessions followed by hands on training on each piece of equipment. Hands on training shall include start-up, operation in all modes possible, shut-down and any emergency procedures.

F. The Contractor is to provide the County's Representative with a written statement certifying that the system is installed in accordance with the contract document requirement, that the systems have been adjusted and balanced and that all fire and smoke stopping is done and are performing as specified. Any non-conformance shall be listed.

G. The Contractor shall demonstrate to the County's Representative that equipment and systems are performing as certified, when requested to do so.

H. Guarantee of Work:
   1. Where applicable, furnish manufacturer's written warranty for materials and equipment.
   2. Insert warranties in appropriate locations in operating and maintenance manuals.
   3. Materials and equipment, which have seasonal operation limitations, shall be guaranteed for one year from date of seasonally appropriate test, and acceptance in writing by the County.

2.2 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

2.3 CABLING

A. Comply with NECA 1.

B. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces.

C. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use NRTL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.

D. Install LAN cables using techniques, practices, and methods that are consistent with specified category rating of components and that ensure specified category performance of completed and linked signal paths, end to end.

E. Install cables without damaging conductors, shield, or jacket.

2.4 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "Identification For Electrical Systems."

B. Label each power monitoring and control module with a unique designation.

2.5 GROUNDING

A. Comply with IEEE 1100, "Power and Grounding Sensitive Electronic Equipment."

2.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:
   1. Electrical Tests: Use caution when testing devices containing solid-state components.
   2. Continuity tests of circuits.
   3. Operational Tests: Set and operate controls at workstation and at monitored and controlled devices to demonstrate their functions and capabilities. Use a methodical sequence that cues and reproduces actual operating functions as recommended by manufacturer. Submit sequences for approval. Note response to each test command and operation. Note time intervals between initiation of alarm conditions and registration of alarms at central-processing workstation.
      a. Coordinate testing required by this Section with that required by Sections specifying equipment being monitored and controlled.
      b. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of calculated battery operating time.
      c. Verify accuracy of graphic screens and icons.
      d. Metering Test: Load feeders, measure loads on feeder conductor with an rms reading clamp-on ammeter, and simultaneously read indicated current on the same phase at central-processing workstation. Record and compare values measured at the two locations. Resolve discrepancies and record resolution method and results.
      e. Record metered values, control settings, operations, cues, time intervals, and functional observations and submit test reports printed by workstation printer.

C. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.

D. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.

E. Reports: Written reports of tests and observations. Record defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments.

F. Remove and replace malfunctioning devices and circuits and retest as specified above.

2.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train County's maintenance personnel to adjust, operate, and maintain systems. Refer to Division 01 Section "Demonstration and Training."
   1. Train County's management and maintenance personnel in interpreting and using monitoring displays and in configuring and using software and reports. Include troubleshooting, servicing, adjusting, and maintaining equipment. Provide a minimum of 12 hours' training.
   2. Training Aid: Use approved final versions of software and maintenance manuals as training aids.

2.8 ON-SITE ASSISTANCE

A. Work with County to do initial setup. Make recommendation of all settings.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other-than-normal occupancy hours for this purpose.

END OF SECTION 26 09 13

SECTION 26 09 43

NETWORK LIGHTING CONTROLS – LUTRON

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Digital-network lighting control system and associated components:
   1. Power panels.
   2. Fluorescent electronic dimming ballasts.
   3. LED drivers.
   4. Power interfaces.
   5. Main units (Lutron Grafik Eye QS).
   6. Lighting control modules (Lutron Energi Savr Node).
   7. Energy meter.
   8. Digital dimming ballast and switching modules (Lutron EcoSystem).
   9. Lighting management hubs.
   10. Lighting management system computers.
   11. Lighting management system software.
   12. Control stations.
   13. Low-voltage control interfaces.
   14. Wired sensors.
   15. Wireless sensors.
   16. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 12 24 00 - Window Shades: Motorized roller window shades, for interface with lighting control system.

B. Section 23 09 23: Digital Control Equipment, for interface with lighting control system.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 27 41 16: Audio-video system and Equipment, for interface with lighting control system.

1.3 REFERENCE STANDARDS

A. ANSI C12.20 - American National Standard for Electricity Meters - 0.2 and 0.5 Accuracy Classes; 2010.

B. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts - Supplements; 2011.

C. ANSI/ESD S20.20 - Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices); 2007.

D. ASTM D4674 - Standard Practice for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Office Environments; 2002a (Reapproved 2010).

E. CAL TITLE 24 P6 – California Code of Regulations, Title 24, Part 6 (California Energy Code); 2013.

F. IEC 60669-2-1 - Switches for Household and Similar Fixed Electrical Installations - Part 2-1: Particular Requirements - Electronic Switches; 2009.

G. IEC 60929 - AC and/or DC-Supplied Electronic Control Gear for Tubular Fluorescent Lamps - Performance Requirements; 2011.

H. IEC 61000-4-2 - Electromagnetic Compatibility (EMC) - Part 4-2: Testing and Measurement Techniques - Electrostatic Discharge Immunity Test; 2008.

I. IEC 61000-4-5 - Electromagnetic Compatibility (EMC) - Part 4-5: Testing and Measurement Techniques - Surge Immunity Test; 2008.

J. IEC 61347-2-3 - Lamp Control Gear - Part 2-3: Particular Requirements for A.C. and/or D.C. Supplied Electronic Control Gear for Fluorescent Lamps; 2011.

K. IEC 61347-2-13 - Lamp Control Gear - Part 2-13: Particular Requirements for D.C. or A.C. Supplied Electronic Control Gear for LED Modules; 2006.

L. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).

M. ISO 9001 - Quality Management Systems-Requirements; 2008.

N. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

O. NECA 130 - Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association; 2010.

P. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; National Electrical Manufacturers Association; 2011.

Q. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2010).

R. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

S. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances; Current Edition, Including All Revisions.

T. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

U. UL 508 - Industrial Control Equipment; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

V. UL 508A - Industrial Control Panels; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

W. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

X. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.

Y. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

Z. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.

AA. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of sensors and wall controls with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate the placement of wall controls with actual installed door swings.
   3. Coordinate the placement of daylight sensors with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
   4. Where motorized window treatments are to be controlled by the lighting control system provided under this section, coordinate the work with other trades to provide compatible products.
   5. Coordinate the work to provide luminaires and lamps compatible with the lighting controls to be installed.
   6. Notify County's Representative of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Preinstallation Meeting: Conduct on-site meeting with lighting control system manufacturer prior to commencing work as part of manufacturer's standard startup services. Manufacturer to review with installer:
   7. Low voltage wiring requirements.
   8. Separation of power and low voltage/data wiring.
   9. Wire labeling.
   10. Lighting management hub locations and installation.
   11. Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "DIGITAL-NETWORK LIGHTING CONTROL SYSTEM - GENERAL REQUIREMENTS", sensor locations to be reviewed in accordance with layout provided by Lighting Control Manufacturer. Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated.
   12. Control locations.
   13. Computer jack locations.
   14. Load circuit wiring.
   15. Network wiring requirements.
   16. Connections to other equipment.
   17. Installer responsibilities.
   18. Power panel locations.

C. Sequencing:
   19. Do not install sensors and wall controls until final surface finishes are complete, or as directed by County's Representative.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Design Documents: Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "DIGITAL-NETWORK LIGHTING CONTROL SYSTEM - GENERAL REQUIREMENTS", Lighting Control Manufacturer to provide plans indicating occupancy/vacancy and/or daylight sensor locations.

C. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
   1. Occupancy/Vacancy Sensors: Include detailed basic motion detection coverage range diagrams.

D. Shop Drawings:
   2. Provide schematic system riser diagram indicating component interconnections. Include requirements for interface with other systems.
   3. Provide detailed sequence of operations describing system functions.

E. Samples:
   4. Wall Controls:
   5. Show available color and finish selections.

6. Provide one sample(s) for each product upon request.
7. Sensors: Provide one sample(s) for each product upon request

F. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. System Performance-Verification Documentation; Lutron LSC-SPV-DOC: Include as part of the base bid additional costs for manufacturer's enhanced documentation detailing start-up performance-verification procedures and functional tests performed along with test results.

H. Title 24 Acceptance Testing Documentation: Submit Certification of Acceptance and associated documentation for lighting control acceptance testing performed in accordance with CAL TITLE 24 P6, as specified in Part 3 under “COMMISSIONING”.

I. Project Record Documents: Record actual installed locations and settings for lighting control system components.

J. Operation and Maintenance Data: Include detailed information on lighting control system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

K. Warranty: Submit sample of manufacturer's Warranty or Enhanced Warranty as specified in Part 1 under "WARRANTY". Submit documentation of final execution completed in County's name and registered with manufacturer.

L. Software: One copy of software provided under this section.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications:
1. Company with not less than ten years of experience manufacturing lighting control systems of similar complexity to specified system.
2. Registered to ISO 9001, including in-house engineering for product design activities.
3. Qualified to supply specified products and to honor claims against product presented in accordance with warranty.

D. Title 24 Acceptance Testing Technician Qualifications: Certified by a California approved Acceptance Test Technician Certification Provider as an Acceptance Test Technician (ATT) in accordance with CAL TITLE 24 P6.

E. Maintenance Contractor Qualifications: Manufacturer's authorized service representative.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.
   1. System Requirements - Lutron, Unless Otherwise Indicated:
      a. Ambient Temperature:
         1) Lighting Control System Components, Except Those Listed Below: Between 32 and 104 degrees F (0 and 40 degrees C).
         2) Lighting Management System Computer: Between 50 and 90 degrees F (10 and 35 degrees C).
         3) Fluorescent Electronic Dimming Ballasts: Between 50 and 140 degrees F (10 and 60 degrees C).
      b. Relative Humidity: Less than 90 percent, non-condensing.

1.9 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's Standard Warranty, With Manufacturer Start-Up; Lutron Standard 2-Year Warranty; Lutron LSC-B2:
   1. Manufacturer Lighting Control System Components, Except Lighting Management System Computer, Ballasts/Drivers and Ballast Modules:
      a. First Two Years:
         1) 100 percent replacement parts coverage, 100 percent manufacturer labor coverage to troubleshoot and diagnose a lighting issue.
         2) First-available on-site or remote response time.
         3) Remote diagnostics for applicable systems.
      b. Telephone Technical Support: Available 24 hours per day, 7 days per week, excluding manufacturer holidays.
   2. Lighting Management System Computer: One year 100 percent parts coverage, one year 100 percent manufacturer labor coverage.
   3. Ballasts/Drivers and Ballast Modules: Five years 100 percent parts coverage, no manufacturer labor coverage.

C. Include as part of the base bid additional costs for manufacturer's Enhanced Warranty with manufacturer Start-up; Gold Enhanced Warranty; Lutron LSC-E8G; coverage to include items listed under manufacturer's standard warranty with manufacturer start-up above, plus the following upgrades:
   4. Manufacturer Lighting Control System Components, Except Lighting Management System Computer, Ballasts/Drivers and Ballast Modules:
      a. First Two Years:
         1) Upgrade from as-available Field Service response to 72-hour on-site or remote response time.
         2) Plus annual scheduled Preventive Maintenance Visit.
      b. Additional Coverage for Years 3-5: 50 percent replacement parts coverage, no manufacturer labor coverage.
      c. Additional Coverage for Years 6-8: 25 percent replacement parts coverage, no manufacturer labor coverage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer: Lutron Electronics Company, Inc; www.lutron.com.

B. Other Acceptable Manufacturers:
   1. Encelium.
   2. Crestron.
   3. Products by listed manufacturers are subject to compliance with specified requirements and prior approval of County's Representative.

C. Substitutions: See Section 01 60 00 - Product Requirements
   4. All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by County's Representative a minimum of 10 working days prior to the bid date and must be made available to all bidders. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.
   5. By using pre-approved substitutions, Contractor accepts responsibility and associated costs for all required modifications to related equipment and wiring. Provide complete engineered shop drawings (including power wiring) with deviations from the original design highlighted in an alternate color for review and approval by County's Representative prior to rough-in.

D. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.2 DIGITAL-NETWORK LIGHTING CONTROL SYSTEM - GENERAL REQUIREMENTS

A. Sensor Layout and Tuning: Include as part of of base bid for Lighting Control Manufacturer's Sensor Layout and Tuning service; Lutron LSC-SENS-LT:
   1. Lighting Control Manufacturer to take full responsibility for wired or wireless sensor layout and performance for sensors provided by Lighting Control Manufacturer.
   2. Lighting Control Manufacturer to analyze the reflected ceiling plans, via supplied electronic AutoCAD format, and design a detailed sensor layout that provides adequate occupancy sensor coverage and ensures occupancy and daylight sensor performance per agreed upon sequence of operations. Contractor to utilize the layouts for sensor placement.
   3. During startup, Lighting Control Manufacturer to direct Contractor regarding sensor relocation, as required, should conditions require a deviation from locations specified in the drawings.
   4. Lighting Control Manufacturer to provide up to two additional post-startup on-site service visits within one calendar year from Date of Substantial Completion to fine-tune sensor calibration per the agreed upon sequence of operations.

B. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) as suitable for the purpose indicated.

C. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the control intent indicated.

D. Shade Control Requirements:
   5. Capable of operating shades and recalling shade presets via keypad, contact closure input, infrared receiver, lighting management system software, or other lighting control system interface.
   6. Capable of operating any individual, group, or subgroup of shade electronic drive units within system without requiring separate group controllers.
   7. Capable of assigning and reassigning individual, groups, and subgroups of shades to any control within system without requiring additional wiring or hardware changes.
   8. Capable of controlling shade speed for tracking within plus or minus 0.125 inch (3.17 mm) throughout entire travel.
   9. Provide 10 year power failure memory for preset stops, open and close limits, shade grouping and sub grouping and system configuration.
   10. Capable of synchronizing multiple shade electronic drive units of the same size to start, stop and move in unison.
   11. Capable of stopping shades within accuracy of 0.125 inch (3.17 mm) at any point between open and close limits.

12. Capable of storing up to 250 programmable stop points, including open, close, and any other position.
13. Capable of controlling lights and shades from single wall control button.

E. Design lighting control equipment for 10 year operational life while operating continually at any temperature in an ambient temperature range of 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C) and 90 percent non-condensing relative humidity.

F. Electrostatic Discharge Tolerance: Design and test equipment to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2.

G. Dimming and Switching (Relay) Equipment:
14. Designed so that electrolytic capacitors operate at least 36 degrees F (20 degrees C) below the capacitor's maximum temperature rating when the device is under fully loaded conditions at maximum rated temperature.
15. Inrush Tolerance:
    a. Utilize load-handling thyristors (SCRs and triacs), field effect transistors (FETs) and isolated gate bipolar transistors (IGBTs) with maximum current rating at least two times the rated operating current of the dimmer/relay.
    b. Capable of withstanding repetitive inrush current of 50 times the operating current without impacting lifetime of the dimmer/relay.
16. Surge Tolerance:
    a. Panels: Designed and tested to withstand surges of 6,000 V, 3,000 amps according to IEEE C62.41.2 and IEC 61000-4-5 without impairment to performance.
    b. Other Power Handling Devices: Designed and tested to withstand surges of 6,000 V, 200 amps according to IEEE C62.41.2 without impairment to performance.
17. Power Failure Recovery: When power is interrupted and subsequently restored, within 3 seconds lights to automatically return to same levels (dimmed setting, full on, or full off) as prior to power interruption.
18. Dimming Requirements:
    a. Line Noise Tolerance: Provide real-time cycle-by-cycle compensation for incoming line voltage variations including changes in RMS voltage (plus or minus 2 percent change in RMS voltage per cycle), frequency shifts (plus or minus 2 Hz change in frequency per second), dynamic harmonics, and line noise.
        1) Systems not providing integral cycle-by-cycle compensation to include external power conditioning equipment as part of dimming system.
    b. Incorporate electronic "soft-start" default at initial turn-on that smoothly ramps lights up to the appropriate levels within 0.5 seconds.
    c. Utilize air gap off to disconnect the load from line supply.
    d. Control all light sources in smooth and continuous manner. Dimmers with visible steps are not acceptable.

e. Load Types:
   1) Assign a load type to each dimmer that will provide a proper dimming curve for the specific light source to be controlled.
   2) Provide capability of being field-configured to have load types assigned per circuit.

f. Minimum and Maximum Light Levels: User adjustable on a circuit-by-circuit basis.

g. Line Voltage Dimmers:
   1) Dimmers for Magnetic Low Voltage (MLV) Transformers:
      a) Provide circuitry designed to control and provide a symmetrical AC waveform to input of magnetic low voltage transformers per UL 1472.
      b) Dimmers using unipolar load current devices (such as FETs or SCRs) to include DC current protection in the event of a single device failure.
   2) Dimmers for Electronic Low Voltage (ELV) Transformers: Operate transformers via reverse phase control. Alternately, forward phase control dimming may be used if dimming equipment manufacturer has recommended specific ELV transformers being provided.
   3) Dimmers for Neon and Cold Cathode Transformers:
      a) Magnetic Transformers: Listed for use with normal (low) power factor magnetic transformers.
      b) Electronic Transformers: Must be supported by the ballast equipment manufacturer for control of specific ballasts being provided.

h. Low Voltage Dimming Modules:
   1) Coordination Between Low Voltage Dimming Module and Line Voltage Relay: Capable of being electronically linked to a single zone.
   2) Single low voltage dimming module; capable of controlling the following light sources:
      a) 0-10V analog voltage signal.
         (2) Provide Class 2 isolated 0-10V output signal conforming to IEC 60929.
         (3) Sink current according to IEC 60929.
         (4) Source current.
      b) 10-0V reverse analog voltage signal.
      c) DSI digital communication.
      d) DALI broadcast communication per IEC 60929:
         (5) Logarithmic intensity values complying with IEC 60929.
         (6) Linear intensity values for use with LED color intensity control.
      e) PWM per IEC 60929.

19. Switching Requirements:
    a. Rated Life of Relays: Typical of 1,000,000 cycles at fully rated 16 A for all lighting loads.
    b. Switch load in a manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.

c. Provide output fully rated for continuous duty for inductive, capacitive, and resistive loads.

H. Device Finishes:
20. Wall Controls: To be selected by County's Representative.
21. Standard Colors: Comply with NEMA WD1 where applicable.
22. Color Variation in Same Product Family: Maximum delta E of 1, CIE L*a*b color units.
23. Visible Parts: Exhibit ultraviolet color stability when tested with multiple actinic light sources as defined in ASTM D4674. Provide proof of testing upon request.

I. Interface with building automation system <<as specified in Section _____>>; Lutron System and Network Integration Consultation; LSC-INT-VISIT.

2.3 POWER PANELS

A. Provide power panels with configurations as indicated on the drawings.

B. Product(s):
1. Relay Panels:
a. Product: Lutron XP Series Switching Panels.
b. Provide surface-mounted enclosures as indicated.
c. Switching Requirements:
1) Utilize 20 A continuous-use rated switching modules; able to switch 20 A receptacles.
2) Rated Life of Relay: Typical of 1,000,000 cycles at fully rated 16 A for all lighting loads.
3) Switch load in a manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
4) Provide output fully rated for continuous duty for inductive, capacitive, and resistive loads.

2.4 FLUORESCENT ELECTRONIC DIMMING BALLASTS

A. General Requirements:
1. Designed for 10 year operational life while operating at maximum case temperature and 90 percent non-condensing relative humidity.
2. Designed and tested to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2.
3. Lamp Starting Method: Programmed rapid start.
4. Maximum Inrush Current: 7 amperes for 120V ballasts and 3 amperes for 277V ballasts.
5. Current Crest Factor (CCF): Less than 1.7.
6. Comply with ANSI C82.11 and list and label as complying with UL 935.
7. Designed to not interfere with infrared devices operating at frequencies between 38 kHz and 42 kHz.

8. Manufactured in a facility that employs ESD reduction practices in compliance with ANSI/ESD S20.20.
9. Inaudible in a 27 dBA ambient.
10. No visible change in light output with a variation of plus or minus 10 percent line voltage input.
11. Actively prevent overheating in T5-HO linear fluorescent lamp applications.
12. Ballasts to track evenly across multiple lamp lengths and all light levels.
13. Comply with IEC 61347-2-3 as applicable.

B. 3-Wire Control:
14. Provide integral fault protection to prevent ballast failure in the event of a mis-wire.

C. Digital Control:
15. Monitor and report lamp and ballast status.
16. Lights automatically return to the setting prior to power interruption.
17. Each ballast responds independently to:
    a. Up to 32 occupant sensors.
    b. Up to 64 personal control inputs.
    c. Two daylight sensors.
18. Unique internal reference number visibly displayed on ballast cover.
19. Averages two independent daylight harvesting inputs internally.
20. Responds to digital load shed command. (Example: If light output is at 30 percent and a load shed command of 10 percent is received, the ballast automatically sets the maximum light output at 90 percent and lowers current light output by three percent to 27 percent).

D. Product(s):
21. 3-Wire Control, One Percent Dimming; Lutron Hi-lume:
    a. Dimming Range: 100 percent to one percent relative light output for T4 compact and T5-HO lamps.
    b. Surge Tolerance: Designed and tested to withstand Category A surges of 6,000 V according to IEEE C62.41.2 without impairment of performance.
    c. Total Harmonic Distortion (THD): Less than 10 percent.
22. 3-Wire and Digital Control, One Percent Dimming; Lutron Hi-lume 3D:
    a. Dimming Range: 100 percent to less than one percent relative light output for T8, T5 and T5HO, and five percent relative light output for T5 twin-tube lamps.
    b. Surge Tolerance: Designed and tested to withstand Category A surges of 6,000 V according to IEEE C62.41.2 without impairment of performance.
    c. Total Harmonic Distortion (THD): Less than 10 percent typical (15 percent for select models).
23. 3-Wire and Digital Control, Ten Percent Dimming; Lutron EcoSystem:
    a. Dimming Range: 100 to ten percent relative light output for T8, T5, T5HO, and T5 twin-tube, and five percent relative light output for T4 compact lamps.

b. Surge Tolerance: Designed and tested to withstand Category A surges of 4,000 V according to IEEE C62.41.2 without impairment of performance.
c. Total Harmonic Distortion (THD): Less than 10 percent typical (15 percent for select models).
d. Digital Control:
   1) Connect without interface (except for T4 compact lamp ballasts) to:
      a) Occupancy sensors.
      b) Daylight sensor.
      c) Personal control input (keypad or infrared receiver).
   2) Provide a 20V DC source to power connected sensors.
   3) Generate digital communication commands to distribute ballast and sensor data on the digital bus.

24. Digital Control, One Percent Dimming; Lutron EcoSystem H-Series:
    a. Dimming Range: 100 to less than one percent relative light output for T8, and one percent relative light output for T5 and T5HO lamps.
    b. Surge Tolerance: Designed and tested to withstand Category A surges of 4,000 V according to IEEE C62.41.2 without impairment of performance.
    c. Total Harmonic Distortion (THD): Less than 10 percent typical (15 percent for select models).

2.5 LED DRIVERS

A. General Requirements:
   1. Designed for 10 year operational life while operating at maximum case temperature and 90 percent non-condensing relative humidity.
   2. Designed and tested to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2.
   3. UL 8750 recognized or listed as applicable.
   4. Complies with IEC 61347-2-13 as applicable.
   5. Surge Tolerance: Designed and tested to withstand Category A surges of 4,000 V according to IEEE C62.41.2 without impairment of performance.
   6. Manufactured in a facility that employs ESD reduction practices in compliance with ANSI/ESD S20.20.
   7. Class A sound rating; Inaudible in a 27 dBA ambient.
   8. No visible change in light output with a variation of plus or minus 10 percent line voltage input.
   9. Total Harmonic Distortion (THD): Less than 20 percent for loads greater than 25W; comply with ANSI C82.11.
   10. Drivers to track evenly across multiple lamp lengths and all light levels.
   11. Configuration tool available to optimize the following for LED fixtures:
       a. Light level.
       b. Efficacy.
       c. Thermal performance.

B. 3-Wire Control:

12. Provide integral fault protection to prevent driver failure in the event of a mis-wire.
13. Operate from input voltage of 120 V through 277 V at 60 Hz.

C. Digital Control:
14. Lights automatically return to the setting prior to power interruption.
15. Operate from input voltage of 120 V through 277 V at 60 Hz.
16. Each driver responds independently to:
    a. Up to 32 occupant sensors.
    b. Up to 16 daylight sensors.
17. Responds to digital load shed command. (Example: If light output is at 30 percent and a load shed command of 10 percent is received, the ballast automatically sets the maximum light output at 90 percent and lowers current light output by three percent to 27 percent).

D. Product(s):
18. Forward Phase (Neutral Wire Required), 3-Wire, and Digital Control, One Percent Dimming; Lutron A-Series:
    a. Dimming Range: 100 to one percent relative light output.
    b. Maximum Inrush Current: 2 amperes for 120V and 277V drivers.
    c. Constant Current Drivers:
        1) Support from 200 mA to 2.1 A (in 10 mA steps) to ensure a compatible driver exists.
        2) Support LED arrays up to 40W or 53 W (710 mA to 1.05 A in 10 mA steps).
    d. Constant Voltage Drivers:
        1) Support from 10 V to 60 V (in 0.5 V steps) to ensure a compatible driver exists.
        2) Support LED arrays up to 40W.
19. Digital Control, Five Percent Dimming; Lutron EcoSystem 5-Series:
    a. Dimming Range: 100 to five percent relative light output.
    b. Maximum Inrush Current: Meets NEMA 410 inrush requirements.
    c. Constant Current Drivers:
        1) Support from 220 mA to 1.4 A to ensure a compatible driver exists.
        2) Support LED arrays up to 60W.

2.6 POWER INTERFACES

A. Provide power interfaces as indicated or as required to control the loads as indicated.

B. General Requirements:
1. Phase independent of control input.
2. Rated for use in air-handling spaces as defined in UL 2043.
3. Utilize air gap off to disconnect the load from line supply.
4. Diagnostics and Service: Replacing power interface does not require re-programming of system or processor.

C. Product(s):
   5. Phase-Adaptive Power Module; Lutron PHPM-PA: Provides interface for phase control input to provide full 16 A circuit output of forward/reverse phase control for compatible loads.
   6. 3-Wire Fluorescent Power Module; Lutron PHPM-3F: Provides interface for phase control input to provide full 16 A circuit output for compatible line-voltage control fluorescent electronic dimming ballasts.
   7. Switching Power Module; Lutron PHPM-SW: Provides interface for phase control input to provide full 16 A circuit output of switching for compatible non-dim loads.
   8. Phase-Adaptive Power Module with 3-Wire Fluorescent Input; Lutron PHPM-WBX: Provides interface for fluorescent ballast control input to provide full 16 A circuit output for compatible loads.
   9. Ten Volt Interface; Lutron GRX-TVI: Provides interface for phase control input to provide full 16 A circuit output of switching and 0-10 V low voltage control for compatible fluorescent electronic dimming ballasts.

2.7 MAIN UNITS (LUTRON GRAFIK EYE QS)

A. Product: Lutron GRAFIK Eye QS.

B. Provide main units with configuration and quantity of zones as indicated or as required to control the loads as indicated.

C. Connects to lighting management hub via RS485.

D. Finish: Standard white with translucent top door, unless otherwise indicated

E. Engrave units with button, zone, and scene descriptions as indicated on the drawings.

F. Integrated Wireless Capability:
   1. Provide wireless communication inputs for:
   2. Occupancy sensors.
   3. Daylight sensors.
   4. Wireless controller.
   5. RF Range: 30 feet (9 m) between sensor and compatible RF receiving device(s).
   6. RF Frequency: 434 MHz; operate in FCC governed frequency spectrum for periodic operation; continuous transmission spectrum is not permitted.

G. Preset Lighting Control with Zone Override:
   7. Intensity for each zone indicated by means of one illuminated bar graph per zone.
   8. User-programmable zone and scene names.
   9. Utilize air gap off to disconnect the load from line supply.
   10. Astronomical time clock and programmer interface provides access to:
      a. Scene selections.
      b. Fade zone to a level.
      c. Fine-tuning of preset levels with scene raise/lower.

d. Lock out scenes and zones.
e. Fine-tuning of light levels with individual zone raise/lower.
f. Terminal block for wired infrared signal input.
g. Enable/disable wall station.

11. Light intensity with real time energy savings by digital display.
12. Fade time indicated by digital display for current scene while fading.
13. Integral wide angle infrared receiver.
14. For temporary local overrides, individual raise/lower buttons to allow zones to be adjusted without altering scene values stored in memory.
15. Direct Low-Voltage Control of Digital Ballasts and LED drivers (120V, 220/240V, 277V and/or 347V Lighting):
    a. Electronically link a digital fluorescent lighting ballast to a zone for both dimming and turning on/off.
    b. Electronically assign daylight sensors to digital ballasts and line voltage dimmers for proportional daylight harvesting.
    c. Single integral controller with Class 1 or Class 2 isolated digital output signal conforming to IEC 60929; capable of direct control without interface.
16. Creates daylighting rows independent of control zones.
17. Capable of re-zoning without re-wiring using programming display on unit.
18. Outputs can be virtually mapped to other device's outputs.
19. Zone raise/lower buttons capable of controlling local lighting loads connected to the main unit or remote lighting zones in the system.

H. Preset Shade Control with Zone Override:
20. Preset expandable shade control: Provide up to three columns of shade control.
21. For temporary local overrides, individual raise/lower buttons to allow zones to be adjusted without altering scene values stored in memory.
22. Provides one direct-wired occupancy sensor connection without interface or power pack.

2.8 LIGHTING CONTROL MODULES (LUTRON ENERGI SAVR NODE)

A. Provide lighting control modules as indicated or as required to control the loads as indicated.

B. General Requirements:
1. Listed to UL 508 as industrial control equipment.
2. Delivered and installed as a listed factory-assembled panel.
3. Passively cooled via free-convection, unaided by fans or other means.
4. Mounting: Surface.
5. Connection without interface to wired:
6. Occupancy sensors.
7. Daylight sensors.
8. IR receivers for personal control.
    a. Connects to lighting management hub via RS485.

b. LED status indicators confirm communication with occupancy sensors, daylight sensors, and IR receivers.
c. Contact Closure Input:
d. Directly accept contact closure input from a dry contact closure or sold-state output without interface to:
    1) Activate scenes.
        a) Scene activation from momentary or maintained closure.
    2) Enable or disable after hours.
        a) Automatic sweep to user-specified level after user-specified time has elapsed.
        b) System will provide occupants a visual warning prior to sweeping lights to user-specified level.
    3) Occupant can reset timeout by interacting with the lighting system.
        a) Activate or deactivate demand response (load shed).
        b) Load shed event will reduce lighting load by user-specified amount.

9. Emergency Contact Closure Input:
    a. Turn all zones to full output during emergency state via direct contact closure input from UL 924 listed emergency lighting interface, security system or fire alarm system.
    b. Allow configurable zone response during emergency state.
    c. Disable control operation until emergency signal is cleared.
10. Supplies power for control link for keypads and control interfaces.
11. Distributes sensor data among multiple lighting control modules.
12. Capable of being controlled via wireless sensors and controls.

C. Switching Lighting Control Modules:
13. Product(s):
    a. Lutron SoftSwitch Energi Savr Node; Model QSN-4S16-S: 16 A continuous-use per channel.
    b. Lutron SoftSwitch Energi Savr Node; Model QSN-4S20-S: 20 A (16 A ballast) continuous-use per channel.
14. Switching:
    a. Rated Life of Relay: Typical of 1,000,000 cycles at fully rated 16 A for all lighting loads.
    b. Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
    c. Fully rated output continuous duty for inductive, capacitive, and resistive loads.
    d. Module to integrate up to four individually controlled zones.
    e. Utilize air gap off, activated when user selects "off" at any control to disconnect the load from line supply.

D. 0-10V Lighting Control Modules:
15. Product(s):
    a. Lutron 0-10V Energi Savr Node; Model QSN-4T16-S: 16 A continuous-use per channel.

b. Lutron 0-10V Energi Savr Node; Model QSN-4T20-S: 20 A (16 A ballast) continuous-use per channel.

16. Coordination Between Low Voltage Dimming Module and Line Voltage Relay: Capable of being electronically linked to single zone.
17. Single low voltage dimming module; capable of controlling following light sources:
    a. 0-10V analog voltage signal.
        1) Provide Class 2 isolated 0-10V output signal conforming to IEC 60929.
        2) Sink current per IEC 60929.
    b. 10V-0V analog voltage signal.
        1) Provide Class 2 isolated 0-10V output signal conforming to IEC 60929.
        2) Sink current per IEC 60929.
18. Switching:
    a. Rated Life of Relay: Typical of 1,000,000 cycles at fully rated 16 A for all lighting loads.
    b. Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
    c. Fully rated output continuous duty for inductive, capacitive, and resistive loads.
    d. Module to integrate up to four individually controlled zones.
    e. Utilize air gap off, activated when user selects "off" at any control to disconnect the load from line supply.

E. Digital Fixture Lighting Control Modules:
19. Product(s):
    a. Lutron EcoSystem Energi Savr Node; Model QSN-1ECO-S: One EcoSystem Digital Link.
    b. Lutron EcoSystem Energi Savr Node; Model QSN-2ECO-S: Two EcoSystem Digital Links.
20. Provides two-way feedback with digital fixtures for energy monitoring, light level status, lamp failure reporting, and ballast/driver failure reporting.
21. Provide testing capability using manual override buttons.
22. Each low-voltage digital communication link to support up to 64 ballasts or LED drivers capable of NFPA 70 Class 1 or Class 2 installation.

F. Total Light Management Control Module (Digital Lighting and Shades Control):
23. Product: Lutron EcoSystem with Shades Energi Savr Node; Model QSN-2ECO-PS120 - Two EcoSystem Digital Links.
24. Ten fused 30W (60W peak) 24V DC outputs provide power to compatible shades, drapery drive units, keypads, and accessories.
25. Provide power for 10 to 30 shades dependent on shade dimensions.
26. Provide smart diagnostics for system verification.
27. Provide testing capability using manual override buttons.
28. Each low-voltage digital communication link to support up to 64 ballasts capable of NFPA 70 Class 1 or Class 2 installation.

2.9 DIGITAL DIMMING BALLAST AND SWITCHING MODULES (LUTRON ECOSYSTEM)

A. Provide digital dimming ballast and switching modules as indicated or as required to control the loads as indicated.

B. General Requirements:
   1. Provide continuous 3-wire signal dimming to compatible 3-wire electronic dimming ballasts.
   2. Utilize air gap off to disconnect the load from line supply.
   3. Connect without interface to:
      a. Occupancy sensor.
      b. Daylight sensor.
      c. Personal control input (wall station or infrared receiver).
   4. Generate digital communication commands to distribute ballast and sensor data on the digital bus.
   5. If power is interrupted and subsequently restored, lights automatically return to the setting prior to power interruption.
   6. Each ballast module responds independently to:
      a. Up to 32 occupancy sensors.
      b. Up to 64 personal control inputs.
      c. Two daylight sensors.
   7. Unique internal reference number visible displayed on module cover.
   8. Averages two independent daylight harvesting inputs internally.
   9. Responds to digital load shed command.
      a. Sets high end trim.
      b. Automatically scales light output proportional to load shed command. (Example: If light output is at 30 percent and a load shed command of 10 percent is received, the ballast to automatically set the maximum light output at 90 percent and lower current light output by 3 percent to 27 percent).
   10. Provide integral fault protection to prevent ballast module failure in the event of a mis-wire.

C. Product(s):
   11. 3-Wire Ballast Module, 2 Amp; Lutron EcoSystem Model C5-BMF-2A:
      a. Integrates up to 2 amps of 3-wire electronic dimming ballasts into EcoSystem digital control system as a single zone.
   12. 3-Wire Ballast Module, 16 Amp; Lutron EcoSystem Model C5-BMJ-16A:
      a. Integrates up to 16 amps of 3-wire electronic dimming ballasts into EcoSystem digital control system as a single zone.
      b. Integrates up to 16 amps of switched high intensity discharge (HID) lighting load into EcoSystem digital control system as a single zone.
   13. Switching Power Module, 16 Amp; Lutron EcoSystem Model C5-XPJ-16A:
      a. Integrates up to 16 amps of high in-rush lighting load (magnetic fluorescent ballast, electronic fluorescent ballast, HID, incandescent, magnetic low-

voltage, electronic low-voltage, neon/cold cathode and motor loads) into EcoSystem digital control system as a single zone.

2.10 LIGHTING MANAGEMENT HUBS

A. Product: Lutron Quantum Light Management Hub.

B. Provided in a pre-assembled NEMA listed enclosure with terminal blocks listed for field wiring.

C. Connects to controls and power panels via RS485.

D. Enables light management software to control and monitor compatible dimming ballasts and ballast modules, power panels, power modules, and window treatments.
   1. Utilizes Ethernet connectivity to light management computer utilizing one of the following methods:
      a. Dedicated network.
      b. Dedicated VLAN.
      c. Shared network with Building Management System (BMS).
      d. Corporate network where managed switches are configured to allow multicasting and use of IGMP.

E. Integrates control station devices, power panels, shades, preset lighting controls, and external inputs into a single customizable lighting control system with:
   2. Multiple Failsafe Mechanisms:
      a. Power failure detection via emergency lighting interface.
      b. Protection: Lights go to full on if ballast wires are shorted.
      c. Distributed architecture provides fault containment. Single hub failure or loss of power does not compromise lights and shades connected to other lighting management hubs.
   3. Manual overrides.
   4. Automatic control.
   5. Central computer control and monitoring.
   6. Integration with BMS via BACnet.

F. Furnished with astronomical time clock.

G. Furnished with solar clock to track the position of the sun to control the shades to limit penetration of direct sunlight.

H. Maintains a backup of the programming in a non-volatile memory capable of lasting more than ten years without power.

I. BACnet Integration License:
   7. Provide ability to communicate by means of native BACnet IP communication (does not require interface) to lighting control system from a user-supplied 10BASE-T or 100BASE-T Ethernet network.

8. Requires only one network connection per system.
9. Lighting control system to be BACnet Test Laboratory (BTL) listed.
10. Basic BACnet integration license:
    a. The BACnet integrator can command:
        1) Area light output.
        2) Area enable or disable after hours mode.
        3) Area load shed level.
        4) Area load shed enable/disable.
        5) Area shade group presets and levels.
        6) Enable/Disable:
            a) Automated solar adaptive shade control.
            b) Cloudy day/shadow override mode for automated shade control.
            c) Brightness override mode for automated shade control.
            d) Area occupancy sensors.
            e) Area daylighting.
        7) Daylighting level.
        8) Area occupied and unoccupied level
        9) Occupancy sensor timeouts.
    b. The BACnet integrator can monitor:
        1) Area on/off status.
        2) Area occupancy status.
        3) Area fault.
            a) Lamp failures.
            b) Control devices not responding.
        4) Area load shed status.
        5) Area instantaneous energy usage and maximum potential power usage.
        6) Energy savings broken out by strategy (occupancy, timeclock, daylighting, personal control, tuning, load shed) down to the individual area.
        7) Area shade group presets and levels.
        8) Cloudy day and shadow sensor status.
        9) Light levels from window mounted sensors.
        10) Enable/Disable:
            a) Status of automated solar adaptive shade control.
            b) Status of cloudy day/shadow override for automated shade control.
            c) Status of brightness override for automated shade control.
            d) Area occupancy sensors.
            e) Daylighting.
        11) Daylighting level.
        12) Light levels from photo sensors and window mount shadow sensors.
        13) Area occupied and unoccupied level.
        14) Occupancy sensor timeouts.
        15) Shade assignment and grouping to be discoverable with third party building management software.

2.11 LIGHTING MANAGEMENT SYSTEM COMPUTERS

A. Computers:
   1. Product: Lutron Q-Manager.
   2. System PC (Desktop/Laptop):
      a. Suitable for occasional programming, monitoring, and control of digital network lighting controls.
      b. Unless otherwise indicated, computer(s) to be provided by lighting control system manufacturer.
      c. Quantity: Provide allowance for one computer(s).
      d. Location(s): Server Room.
      e. Minimum Hardware Requirements:
         1) Processor: Single Intel® Xeon® processor with minimum speed of 2.0 GHz.
         2) 1 GB RAM.
         3) 80 GB hard drive (30 GB for application).
         4) One 10/100/1000 Ethernet network interface for communication with lighting management hubs.
         5) 17 inch (43 cm) monitor with 1024 x 768 resolution.
         6) 48X CD/DVD-ROM drive.
         7) 4 USB 2.0 ports.
      f. Minimum Software Requirements:
         1) Licensed installation of US English 32-bit or 64-bit Microsoft® Windows® Server 2008 with Service Pack 1.
   3. Server:
      a. Suitable for 24 hour per day, 7 day per week programming, monitoring, control, and data logging of digital-network lighting controls.
      b. Suitable to handle client machine request in multi-computer systems.
      c. Unless otherwise indicated, computer to be provided by lighting control system .
      d. Minimum Hardware Requirements:
         1) Processor: Single Intel® Xeon® processor with minimum speed of 2.0 GHz; Dual Core Intel® processor with minimum speed of 1.86 GHz
         2) 2 GB Ram.
         3) 80 GB hard drive (30 GB for application).
         4) Two 10/100/1000 Ethernet network interfaces - one for communication with lighting management hubs and one for communication with corporate intranet to allow access from system PCs and/or energy saving display terminals. Only one Ethernet network interface is required if all lighting management hubs and client PCs are on the same network.
         5) 17 inch (43 cm) monitor with 1024 x 768 resolution.
         6) 48X CD/DVD-ROM drive.
         7) 4 USB 2.0 ports.
      e. Minimum Software Requirements:
         1) Licensed installation of US English 32-bit or 64-bit Microsoft® Windows® Server 2008 with Service Pack 1.

4. Computers Provided by Lighting Control System Manufacturer: Computer software to be preinstalled and tested prior to shipping.

2.12 LIGHTING MANAGEMENT SYSTEM SOFTWARE

A. Provide system software license and hardware that is designed, tested, manufactured, and warranted by a single manufacturer.

B. Configuration Setup Software:
   1. Product: Lutron Q-Design.
   2. Suitable to make system programming and configuration changes.
   3. Windows-based, capable of running on either central server or a remote client over TCP/IP connection.
   4. Allows manufacturer (either remotely or with on-site service call) to:
      a. Capture system design:
         1) Geographical layout.
         2) Load schedule zoning.
         3) Shade grouping.
         4) Equipment schedule.
         5) Equipment assignment to lighting management hubs.
         6) Daylighting design.
      b. Define the configuration for the following in each area:
         1) Lighting scenes.
         2) Shade group presets.
         3) Control station devices.
         4) Interface and integration equipment.
         5) Occupancy/after hours.
         6) Partitioning.
         7) Daylighting.
         8) Emergency lighting.
         9) Night lights.
      c. Startup:
         1) Addressing.
         2) Daylighting.
         3) Provide customized conditional programming.

C. Control and Monitor Software:
   5. Products:
      a. Lutron Quantum Vue (web-based application).
      b. Lutron Q-Admin (desktop application).
   6. Accessibility and Platform Support:
      a. Lutron Quantum Vue Web-Based Application:
         1) Web-based; runs on most HTML5 compatible browsers (including Internet Explorer, Chrome, and Safari).

2) Supports multiple platforms and devices; runs from a tablet, desktop, laptop, or smartphone; optimized for displays of 1024 by 768 pixels or higher.
3) User interface supports multi-touch gestures such as pinch to zoom, drag to pan, etc.
4) Utilizes HTTPS (industry-standard certificate-based encryption and authentication for security).

b. Lutron Q-Admin Desktop Application:
1) Client installation for Windows-based operating systems only.

7. System Navigation and Status Reporting:
a. Lutron Quantum Vue Web-Based Application: Performed using graphical floor plan view or a generic system layout.
1) Graphical Floor Plan View: Utilizes customized CAD based drawing of the building. Pan and zoom feature allows for easy navigation; dynamically adjusts the details presented based on zoom level.
2) Area, scene, and zone names can be changed in real time.
b. Lutron Q-Admin Desktop Application: Performed using basic system tree view.
8. Control of Lights:
a. Area lights can be monitored for on/off status.
b. All lights in an area can be turned on/off or sent to a specific level.
c. For areas that have been zoned, these areas may be sent to a predefined lighting scene, and individual zones may be controlled.
d. Area lighting scenes can be renamed and modified in real-time, changing the levels that zones go to when a scene is activated.
e. High and low end of area lighting can be tuned/trimmed.
f. Control and monitor area partition status.
9. Control of Shades:
a. Area shades can be monitored for current preset or position.
b. Area shades can be opened/closed, sent to a preset, or sent to a specific position.
10. Occupancy:
a. Area occupancy can be monitored.
b. Area occupancy can be disabled to override occupancy control or in case of occupancy sensor problems.
c. Area occupancy settings including level that lights turn on to when area is occupied, and level that lights turn off to when area is unoccupied can be changed in real-time.
d. Monitor energy savings due to occupancy down to an individual area.
11. Daylighting:
a. Daylighting can be enabled/disabled. Can be used to override the control currently taking place in the space.
b. Daylight calibration can be adjusted for each daylit area.
c. Daylight status can be monitored.
d. Monitor energy savings due to daylight harvesting down to an individual area.

12. Load Shedding; Lutron IntelliDemand: Allows the building manager to monitor whole building lighting power usage and apply a customized load shed reduction to selected areas, thereby reducing a building's power usage; load shedding triggered via Quantum software, BACnet, or OpenADR.
13. Scheduling: Schedule time of day and astronomic time clock events to automate functions.
    a. Adjust or disable a single occurrence of a repeating scheduled event.
    b. Easily monitor and adjust scheduled events using a weekly calendar view.
14. Reporting: Provide reporting capability that allows the building manager to gather real-time and historical information about the system as follows:
    a. Energy Reports: Show a comparison of cumulative energy used over a period of time for one or more areas or meter groups.
    b. Power Reports: Show power usage trend over a period of time for one or more areas or meter groups.
    c. Energy Density Report: Show energy usage in W/sq ft.
    d. Energy Savings By Strategy Report: Show energy savings for any area broken down by strategy (tuning, occupancy, daylighting, scheduled events, personal control, and load shedding).
    e. Activity Report: Show what activity has taken place over a period of time for one or more areas. Activity includes occupant activities (e.g. wall controls being pressed), building manager operation (e.g. controlling/changing areas using the control and monitor tool), and device failures (e.g. keypads or ballasts that are not responding).
        1) Include shade related activities (e.g. automatic movements from Hyperion automated shade algorithm, manual overrides from personal controls, automatic overrides from sensors).
    f. Lamp Failure Report: Shows which areas are currently reporting lamp failures.
    g. Shade Level Report: Shows the shade level for any shade group in the system over any historical 24 hour period.
    h. Shade Position Report: Shows the percentage of time shade groups in the system are at each position.
    i. Sensor Level Report: Shows the light level in footcandles of any photosensor in the system.
    j. Alert Activity Report: Capable of generating historical reports of all alert activity within the system.
    k. Hyperion Automated Shade Control Activity Report: A chart that combines multiple data points regarding the position and performance of Hyperion automated shades.
15. Diagnostics: Allows the building manager to check on the status of all equipment in the lighting control system. Devices to be listed with a reporting status of OK, missing, or unknown.

16. Alerts and Alarms: Monitors the system for designated events/triggers and automatically generates alerts according to configured response criteria.
    a. Capable of monitoring for the following events/triggers:
        1) A failed piece of equipment (e.g. ballast, control, sensor, etc.); alert cleared when equipment is replaced.
        2) A lamp outage (for compatible EcoSystem digital electronic dimming ballasts only); alert cleared when lamp is replaced.
        3) Low battery conditions in battery-operated sensors and controls; alert cleared when battery is replaced.
        4) Luminaires with lamp operating hours in excess of designated time.
        5) A load shed event; alert generated for beginning and end of trigger.
        6) Energy usage higher than designated threshold target.
        7) Potential light level condition discrepancies (daylight sensors not agreeing with expected lighting status).
    b. View alerts on a customized graphical floor plan.
    c. Capable of generating alerts through visible changes in software or through email messages.
    d. Capable of customizing the frequency of alerts and providing notifications immediately or through daily, weekly, or monthly summaries.
    e. Capable of sending different alerts to different system users.
    f. Capable of generating historical reports of all alert activity within the system.
17. Administration:
    a. Users: Allows new user accounts to be created and existing user accounts to be edited.
        1) Supports Active Directory (LDAP) tying user accounts to network accounts.
    b. Area and feature access can be restricted based on login credentials with three levels of access rights (Admin, Programmer, Controller) and customized access levels available.
    c. Publish Graphical Floor Plan: Allows admin user to publish new graphical floor plan files, allowing users to monitor the status of lights, occupancy of areas, and daylighting status.
    d. Back-Up Project Database: Allows admin user to back up the project database that holds all the configuration information for the system, including keypad programming, areas scenes, daylighting, occupancy programming, emergency levels, night lights, and time clock.
    e. Publish Project Database: Allows admin user to send a new project database to the server and download the new configuration to the system. The project database holds all the configuration information for the system, including keypad programming, area scenes, daylighting, occupancy programming, emergency levels, night lights, and time clock.
18. Favorite Buttons: Provide global scene control or modes of operation across the entire system.
19. Provides control/monitoring of partition status to automatically reconfigure how the space operates based on the partition's open/closed status.

D. Web Services Integration License:
   20. Provide ability to communicate by means of XML web services
   21. Web services integrator can monitor:
      a. Area instantaneous power usage.
      b. Area instantaneous power savings.
      c. Area energy savings.
      d. Area energy usage.
      e. Area maximum power usage.
   22. Initiate load shed event using OpenADR protocol in an auto-Demand-Response event without additional interfaces or gateways.
   23. Supports both push and pull for integration with third party systems and energy dashboards.

E. Quantum Mobile Control and Programming Software License:
   24. Allows mobile control and programming of Quantum system via an Apple iPad.
   25. Provides users the ability to:
      a. Control and monitor area lighting scenes, zones, and shade presets.
      b. Easily identify zones and shade groups.
      c. Edit area lighting scenes, shade presets, scene fade rates, and scene delay rates.
      d. Restrict user access by area.
      e. Restrict users from ability to make changes.
      f. Historical logging of who made changes available in Q-Admin control and monitor software.
   26. Connects to Quantum system via Wi-Fi.
   27. Can connect directly to processor or through computer (server) in the system.

F. Personal Web-Based Control Software:
   28. Product: Lutron Personna PC.
   29. Lighting Control: Allows the user to use a web browser on their personal PC, laptop, or some mobile devices (supporting 1024 by 768 resolution) to control one or more lights in their area.
      a. The user may select between full on, full off, or a favorite light level.
      b. The user may raise/lower the currently selected lighting level in the area.
   30. Shade Control: Allows the user to use a web browser on their personal PC, laptop, or some mobile devices (supporting 1024 by 768 resolution) to control one or more shades in their area.
      a. The user may select open, closed, or a favorite shade position.
      b. The user may raise/lower a selected shade group in the area.
   31. Supports up to 10,000 users.
   32. Each user to have a login name and password sent from administrator via email when user account created.
   33. Supported Browsers: Microsoft Internet Explorer (versions 7 and higher), Mozilla Firefox (versions 3 and higher), Apple Safari (versions 4 and higher), Google Chrome (versions 8 and higher).

G. Automated Shade Control Software:
   34. Product: Lutron Hyperion.
   35. Objectives:
      a. Uses open loop solar adaptive algorithm to minimize the penetration depth of direct sunlight.
      b. Optimizes energy savings from daylight.
      c. Provides manual override capability for occupants via wall-mounted keypad or simple remote control.
      d. Provides automatic override capability utilizing a local sensor in dark conditions or when excessive brightness occurs.
      e. Maximizes occupants' connectivity with outdoors by optimizing view.
      f. Provides diffuse daylight and minimizes direct sunlight in the space to reduce solar heat gain and maximize occupant comfort in the space.
      g. Reduces glare.
      h. Shades along same facade to start, stop and track in unison to maintain a consistent exterior aesthetic.
      i. Provides optional presets to allow shades to align with architectural elements of the facade.
      j. Provides a preset, also referred to as visor position, to limit maximum amount of light entering a space.
      k. Provides configurable dark and bright override positions.
   36. Hardware: Independent operation of solar tracking program through non-Windows based operating system provided in one or more lighting management hubs.
   37. Control Software:
      a. Incorporates a solar tracking software that:
         1) Calculates the sun's position in the sky relative to the building and then calculates when shade movement is necessary by facade.
         2) Calculates the position of the shade to limit direct sunlight penetration to a predetermined limit.
      b. Controlled using the following inputs for startup:
         1) Building location.
         2) Facade orientation.
         3) Window dimensions.
         4) Solar depth of penetration.
         5) Number of shade movements per day.
         6) Visor position of shades.
         7) Optional presets that align shades with architectural features of the facade.
         8) Light level thresholds for dark and bright override.
         9) Shade position for dark and bright override.
         10) Window position on wall.
      c. Requires minimal long term maintenance and service. Does not require user to make daily changes to programming or overall system functionality, unless desired by County.

38. PC Graphic User Interface: Provides access to all adjustable parameters of solar depth of penetration and number of shade movements per day.
39. Override:
    a. Manual:
        1) Temporary override of the control program capability through optional manual keypads, remote controls, or end-user control software.
        2) Keypads, remote controls, or end-user control software to be capable of providing manual control of shades in a particular area.
        3) Time of manual override to be programmable.
    b. Automatic overrides achievable via rooftop cloudy day sensors or radio window sensors:
        1) Rooftop Cloudy Day Sensors:
            a) Product: Lutron Cloudy Day Sensor; Model QS-CES-R.
            b) Provides automatic override of system on dark cloudy days.
            c) During dark conditions, shades to go to predetermined visor position to maximize view and available daylight.

2.13 CONTROL STATIONS

A. Provide control stations with configuration as indicated or as required to control the loads as indicated.

B. Wired Control Stations:
    1. General Requirements:
        a. Class 2 (low voltage).
        b. UL listed.
        c. Control stations can be replaced without reprogramming.
        d. Finish: White, unless otherwise indicated
    2. Product(s):
        a. Multi-Scene Wired Control:
            1) Product(s):
                a) Lutron seeTouch QS.
                b) Lutron Signature Series.
                c) Lutron Architrave.
            2) Allows control of any devices part of the lighting control system.
            3) Utilize RS485 wiring for low-voltage communication.
            4) Functionality:
                a) Upon button press, LEDs to immediately illuminate.
                b) LEDs to reflect the true system status. LEDs to remain illuminated if the button press was properly processed or LEDs to turn off if the button press was not processed.
                c) Allows for easy reprogramming without replacing unit.
                d) Replacement of units does not require reprogramming.
            5) Provide faceplates with concealed mounting hardware.
            6) Engrave wall stations with button, zone, and scene descriptions as indicated on the drawings.

7) Silk-screened borders, logos, and graduations to use graphic process that chemically bonds graphics to faceplate, resistant to removal by scratching and cleaning.
8) Software Configuration:
   a) Customizable control station device button functionality:
      (2) Buttons can be programmed to perform single defined action.
      (3) Buttons can be programmed to perform defined action on press and defined action on release.
      (4) Buttons can be programmed using conditional logic off of a state variable such as time of day or partition status.
9) Control station device LEDs to support logic that defines when it is illuminated:
   a) Scene logic (logic is true when all zones are at defined levels).
   b) Room logic (logic is true when at least one zone is on).
   c) Pathway (logic is true when at least one zone is on).
   d) Last scene (logic is true when spaces are in defined scenes).
10) Contact Closure Interface: Accepts both momentary and maintained contact closures.
11) Provide integral infrared receiver for personal control where indicated.

b. Single-Scene or Zoned Wired Control:
   1) Product: Lutron Pico Wired Control.
   2) Turn an individual fixture or group of fixtures on and off.
   3) Raise and lower light levels.
   4) Recall favorite light levels.

c. Four-Button Preset Wallstation:
   1) Product: Lutron EcoSystem CC-4BRL Four-Button Control.
   2) Recall four scenes plus all on or all off for one group of fixtures.
   3) Master raise/lower control for entire group of fixtures.
   4) Integral IR receiver for personal control.
   5) Immediate local LED response upon button activation to indicate that a system command has been requested.

C. Infrared Handheld Controls:
   3. Product(s):
      a. Four-Scene Wireless Infrared Transmitter; Lutron Model GRX-IT-WH: Operates up to 50 feet (15 m) line-of-sight to receiver.
      b. Single-Scene Wireless Infrared Transmitter; Lutron Model C-FLRC-WH: Operates up to 12 feet (3.7 m) line-of-sight to receiver.
   4. Quantity: <<As indicated on the drawings; To be determined; provide allowance for _____ control(s); or _____>>.
   5. Designed for use in conjunction with compatible infrared receiver and lighting control; compatibility dependent on that receiver, not transmitter.
   6. Learnable by other variable frequency remote controls.

2.14 LOW-VOLTAGE CONTROL INTERFACES

A. Provide low-voltage control interfaces as indicated or as required to control the loads as indicated.

B. Connects to lighting management hub via RS485.

C. UL listed.

D. Contact Closure Interface:
   1. Product: Lutron Model QSE-IO.
   2. The contact closure input device to accept both momentary and maintained contact closures.
   3. The contact closure output device can be configured for maintained or pulsed outputs.
   4. Contact closure can be programmed using conditional logic off of a state variable such as time of day or partition status.

E. Wallbox Input Closure Interface:
   5. Product: Lutron Model QSE-CI-WCI.
   6. Mounts in wallbox behind contact closure keypad to provide interface for up to eight contact closure inputs.
   7. The contact closure input device to accept both momentary and maintained contact closures.

F. RS232 and Ethernet Interface:
   8. Product: Lutron Model QSE-CI-NWK-E.
   9. Provide ability to communicate via Ethernet or RS232 to audiovisual equipment, touchscreens, etc.
   10. Allow creation of custom output strings.
   11. Provide control of:
      a. Light scene selections.
      b. Fine-tuning of light scene levels with raise/lower.
      c. Shade group presets.
      d. Fine-tuning of shade preset levels with raise/lower.
      e. Simulate system wall station button presses and releases.
   12. Provide status monitoring of:
      a. Light scene status.
      b. Shade group status.
      c. Wall station button presses and releases.
      d. Wall station LEDs.
   13. Provide ability to send custom output strings.

G. Sensor Modules:
   14. Products:
      a. Sensor module with both wired and wireless inputs; Lutron Model QSM2-4W-C.

b. Sensor module with wired inputs only; Lutron Model QSMX-4W-C.
c. Sensor module with wireless inputs only; Lutron Model QSM2-XW-C.

15. Wired Modules:
    a. Provide wired inputs for:
        1) Occupancy sensors.
        2) Daylight sensors.
        3) IR receivers for personal control.
        4) Digital ballast wall stations.
16. Wireless Modules:
    a. Provide wireless communication inputs for:
        1) Occupancy sensors.
        2) Daylight sensors.
        3) Wireless controller.
    b. RF Range: 30 feet (9 m) between sensor and compatible RF receiving devices.
    c. RF Frequency: 434 MHz; operates in FCC governed frequency spectrum for periodic operation; continuous transmission spectrum is not permitted.
17. Communicate sensor information to wired low-voltage digital link for use by compatible devices.

2.15 WIRED SENSORS

A. Wired Occupancy Sensors:
    1. General Requirements:
        a. Connects directly to compatible ballasts and modules without the need of a power pack or other interface.
        b. Turns off or reduces lighting automatically after reasonable time delay when a room or area is vacated by the last person to occupy the space.
        c. Accommodates all conditions of space utilization and all irregular work hours and habits.
        d. Comply with UL 94.
        e. Self-Adaptive: Continually adjusts sensitivity and timing to ensure optimal lighting control for any use of the space.
        f. Furnished with field-adjustable controls for time delay and sensitivity to override any adaptive features.
        g. Provide capability to:
            1) Add additional timeout system-wide without need to make local adjustment on sensor.
            2) Group multiple sensors.
        h. Power Failure Memory: Settings and learned parameters to be saved in non-volatile memory and not lost should power be interrupted and subsequently restored.
        i. Furnished with all necessary mounting hardware and instructions.
        j. Class 2 devices.
        k. Ceiling-Mounted Sensors: Indicate viewing directions on mounting bracket.
        l. Wall-Mounted Sensors: Provide swivel-mount base.

m. Color: White.

2. Wired Passive Infrared Sensors:
   a. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
   b. Ceiling-Mounted Sensors: Provide customizable mask to block off unwanted viewing areas.
   c. Product(s):
      1) Ceiling-Mounted Passive Infrared Sensor, 450 square feet (42 sq m); Lutron Model LOS-CIR-450-WH: Coverage of 450 square feet (42 sq m) with ceiling height of 8 to 12 feet (2.4 to 3.7 m); 360 degree field of view.
      2) Ceiling-Mounted Passive Infrared Sensor, 1500 square feet (140 sq m); Lutron Model LOS-CIR-1500-WH: Coverage of 1500 square feet (140 sq m) with ceiling height of 8 to 12 feet (2.4 to 3.7 m); 360 degree field of view.
      3) Wall-Mounted Passive Infrared Sensor; Lutron Model LOS-WIR-WH: Coverage of 1600 square feet (149 sq m) with ceiling height of 8 to 12 feet (2.4 to 3.7 m); 110 degree field of view.
3. Wired Ultrasonic Sensors:
   a. Utilize an operating frequency of 32 kHz or 40 kHz, crystal-controlled to operate within plus/minus 0.005 percent tolerance.
   b. Product(s):
      1) Ceiling-Mounted Ultrasonic Sensor, 500 square feet (46 sq m); Lutron Model LOS-CUS-500-WH: Coverage of 500 square feet (46 sq m) with ceiling height of 8 to 12 feet (2.6 to 3.7 m); 180 degree field of view.
      2) Ceiling-Mounted Ultrasonic Sensor, 1000 square feet (93 sq m); Lutron Model LOS-CUS-1000-WH: Coverage of 1,000 square feet (93 sq m) with ceiling height of 8 to 12 feet (2.6 to 3.7 m); 180 degree field of view.
      3) Ceiling-Mounted Ultrasonic Sensor, 2000 square feet (186 sq m); : Coverage of 2000 square feet (186 sq m) with ceiling height of 8 to 12 feet (2.6 to 3.7 m); 360 degree field of view.
4. Wired Dual Technology Sensors:
   a. Passive Infrared: Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
   b. Ultrasonic: Utilize an operating frequency of 32 kHz or 40 kHz, crystal-controlled to operate within plus/minus 0.005 percent tolerance.
   c. Ceiling-Mounted Sensors: Provide customizable mask to block off unwanted viewing areas.
   d. Isolated Relay: Provide an internal additional isolated relay with Normally Open, Normally Closed, and Common outputs for use with HVAC control, Data Logging and other control options where indicated.
   e. Integral Photocell: Provide an integral photocell with adjustable sensitivity to prevent lights from turning on when there is sufficient natural light where indicated.

f. Product(s), Without Isolated Relay and Integral Photocell:
   1) Ceiling-Mounted Dual Technology Sensor, 500 square feet (46 sq m); Lutron Model LOS-CDT-500-WH: Coverage of 500 square feet (46 sq m) with ceiling height of 8 to 12 feet (2.6 to 3.7 m); 180 degree field of view.
   2) Ceiling-Mounted Dual Technology Sensor, 1000 square feet (93 sq m); Lutron Model LOS-CDT-1000-WH: Coverage of 1000 square feet (93 sq m) with ceiling height of 8 to 12 feet (2.6 to 3.7 m); 180 degree field of view.
   3) Ceiling-Mounted Dual Technology Sensor, 2000 square feet (186 sq m); Lutron Model LOS-CDT-2000-WH: Coverage of 2000 square feet (186 sq m) with ceiling height of 8 to 12 feet (2.6 to 3.7 m); 360 degree field of view.
   4) Wall-Mounted Dual Technology Sensor; Lutron Model LOS-WDT-WH: Coverage of 1600 square feet (149 sq m) with ceiling height of 8 to 12 feet (2.4 to 3.7 m); 110 degree field of view.

g. Product(s), With Isolated Relay and Integral Photocell:
   1) Ceiling-Mounted Dual Technology Sensor, 500 square feet (46 sq m); Lutron Model LOS-CDT-500R-WH: Coverage of 500 square feet (46 sq m) with ceiling height of 8 to 12 feet (2.6 to 3.7 m); 180 degree field of view; with isolated relay and integral photocell.
   2) Ceiling-Mounted Dual Technology Sensor, 1000 square feet (93 sq m); Lutron Model LOS-CDT-1000R-WH: Coverage of 1000 square feet (93 sq m) with ceiling height of 8 to 12 feet (2.6 to 3.7 m); 180 degree field of view; with isolated relay and integral photocell.
   3) Ceiling-Mounted Dual Technology Sensor, 2000 square feet (186 sq m); Lutron Model LOS-CDT-2000R-WH: Coverage of 2000 square feet (186 sq m) with ceiling height of 8 to 12 feet (2.6 to 3.7 m); 360 degree field of view; with isolated relay and integral photocell.
   4) Wall-Mounted Dual Technology Sensor; Lutron Model LOS-WDT-R-WH: Coverage of 1600 square feet (149 sq m) with ceiling height of 8 to 12 feet (2.4 to 3.7 m); 110 degree field of view; with isolated relay and integral photocell.

B. Sensor Power Packs:
   5. Product(s):
      a. Lutron Model PP-120H Power Pack; 120 VAC power input/24 VDC, 100 mA power output.
      b. Lutron Model PP-230H Power Pack; 230 VAC power input/24 VDC, 100 mA power output.
      c. Lutron Model PP-277H Power Pack; 277 VAC power input/24 VDC, 100 mA power output.
      d. Lutron Model PP-347H Power Pack; 347 VAC power input/24 VDC, 100 mA power output.
      e. Lutron Model PP-DV Power Pack; 120-277 VAC power input/24 VDC, 100 mA power output.

f. Lutron Model PP-DV-M Power Pack; 120-277 VAC power input (manual)/24 VDC, 100 mA power output.
g. Lutron Model PP-SH Power Pack; control relay only (no power input/output); requires another power pack for power and counts as one of three sensors connected to a power pack.

6. Provide sensor power packs where required for power connection to sensors.
7. For ease of mounting, installation and future service, power pack(s) to be able to mount through a 1/2 inch knockout in a standard electrical enclosure and be an integrated, self-contained unit consisting internally of an isolated load switching control relay and a transformer to provide low-voltage power. Transformer to provide power to a minimum of three sensors.
8. Relay Contact Rating: 20 A ballast (120/277 V); 15 A incandescent (120 V).
9. Plenum-rated.
10. Control Wiring Between Sensors and Control Units: Class 2, 18-24 AWG, stranded UL Classified, PVC insulated or TEFLON jacketed cable suitable for use in plenums, where applicable.

C. Infrared Receivers:
11. Product: Lutron Model EC-IR-WH.
12. Use Class 2 wiring for low voltage communication.
13. Can be replaced without reprogramming.
14. 360 degree reception of wireless infrared remote controls.
15. Immediate local LED response upon reception of handheld transmitter communication.
16. Mountable on lighting fixtures or recessed acoustical ceiling tiles.
17. Constructed via sonic welding.
18. Color: White.

D. Wired Daylight Sensors:
19. Digital Interior Daylight Sensor:
    a. Product: Lutron Model EC-DIR-WH.
    b. Use Class 2 wiring for low voltage communication.
    c. Can be replaced without reprogramming.
    d. Open-loop basis for daylight sensor control scheme.
    e. Stable output over temperature from 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C).
    f. Partially shielded for accurate detection of available daylight to prevent fixture lighting and horizontal light component from skewing sensor detection.
    g. Provide linear response from 0 to 500 footcandles.
    h. Integral IR receiver for personal control.
    i. Mountable on lighting fixtures or recessed acoustical ceiling tiles.
    j. Constructed via sonic welding.
    k. Color: White.

20. Daylight Control Package:
    a. Product: Lutron CES Series (Lutron CES Analog Sensor, LC8 Controller, and Power Pack).
    b. Controller:
        1) Product: Lutron Model LC8.
        2) Automatically switches a dry contact according to changes in ambient light levels.
        3) Fully adjustable separate high and low setpoints, with an adjustable dead band between set points to prevent unwanted cycling.
        4) Input time delay to prevent unwanted cycling due to intermittent light level fluctuations.
        5) Signal/setpoint and relay status indication.
        6) Sensor calibration input.
    c. Sensors:
        1) Class 2, three-wire analog devices.
        2) Provision for zero or offset based signal.
        3) Indoor Photo Sensors; Lutron Model CES/I: With fresnel lens and 60 degree cone of response; sensor range of 0 to 750 footcandles.
        4) Outdoor Photo Sensors; Lutron Model CES/O: Weatherproof, with hood over aperture to shield sensor from direct sunlight; sensor range of 0 to 750 footcandles.
        5) Atrium Photo Sensors; Lutron Model CES/A: With translucent dome and 180 degree field of view; sensor range of 2 to 2,500 footcandles.
        6) Skylight Photo Sensors; Lutron Model CES/S: With translucent dome and 180 degree field of view; sensor range of 10 to 7,500 footcandles.

E. Infrared Partition Sensors:
    1. Product: Lutron Model GRX-IRPS-WH.
    2. Provide contact closure based on status of the partition wall (open/close) enabling automatic linking of controls.

1.2 WIRELESS SENSORS

A. General Requirements:
    1. Operational life of 10 years without the need to replace batteries when installed per manufacturer's instructions.
    2. Communicates directly to compatible RF receiving devices through use of a radio frequency communications link.
    3. Does not require external power packs, power wiring, or communication wiring.
    4. Capable of being placed in test mode to verify correct operation from the face of the unit.
    5. RF Range: 30 feet (9 m) between sensor and compatible RF receiving device(s).
    6. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 15, for Class B application.

B. Wireless Occupancy/Vacancy Sensors:
   1. General Requirements:
      a. Provides a clearly visible method of indication to verify that motion is being detected during testing and that the unit is communicating to compatible RF receiving devices.
      b. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
      c. Sensing Mechanism: Passive infrared coupled with technology for sensing fine motions; Lutron XCT Technology. Signal processing technology detects fine-motion passive infrared (PIR) signals without the need to change the sensor's sensitivity threshold.
      d. Provide optional, readily accessible, user-adjustable controls for timeout, automatic/manual-on, and sensitivity.
      e. Turns off lighting after reasonable and adjustable time delay once the last person to occupy the space vacates a room or area. Provide adjustable timeout settings of 1, 5, 15, and 30 minutes.
      f. Capable of turning dimmer's lighting load on to an optional locked preset level selectable by the user. Locked preset range to be selectable on the dimmer from 1 percent to 100 percent.
      g. Color: White.
      h. Provide all necessary mounting hardware and instructions for both temporary and permanent mounting.
      i. Provide temporary mounting means to allow user to check proper performance and relocate as needed before permanently mounting sensor. Temporary mounting method to be design for easy, damage-free removal.
      j. Sensor lens to illuminate during test mode when motion is detected to allow installer to verify coverage prior to permanent mounting.
      k. Ceiling-Mounted Sensors:
         1) Provide surface mounting bracket compatible with drywall, plaster, wood, concrete, and compressed fiber ceilings.
         2) Provide recessed mounting bracket compatible with drywall and compressed fiber ceilings.
         3) Provide customizable mask to block off unwanted viewing areas.
      l. Wall-Mounted Sensors: Provide wall or corner mounting brackets compatible with drywall and plaster walls.
   7. Wireless Combination Occupancy/Vacancy Sensors:
      a. Ceiling-Mounted Sensors: Programmable to operate as an occupancy sensor (automatic-on and automatic-off), an occupancy sensor with low light feature (automatic-on when less than one footcandle of ambient light available and automatic-off), or a vacancy sensor (manual-on and automatic-off).
      b. Wall-Mounted Sensors: Programmable to operate as an occupancy sensor (automatic-on and automatic-off), or a vacancy sensor (manual-on and automatic-off).
      c. Product(s):
         1) Ceiling-Mounted Occupancy/Vacancy Sensor; Lutron Radio Powr Savr Series, Model LFR2-OCR2B-P-WH: Coverage from 324 square feet

(30.2 sq m) to 676 square feet (62.4 sq m) depending on ceiling height from 8 to 12 feet (2.4 to 3.7 m); 360 degree field of view.

2) Wall-Mounted Occupancy/Vacancy Sensor; Lutron Radio Powr Savr Series, Model LFR2-OWLB-P-WH: Minor motion coverage of 1500 square feet (139.4 sq m) and major motion coverage of 3000 square feet (278.7 sq m) with mounting height of 6 to 8 feet (1.6 to 2.4 m); 180 degree field of view.
3) Corner-Mounted Occupancy/Vacancy Sensor; Lutron Radio Powr Savr Series, Model LFR2-OKLB-P-WH: Minor motion coverage of 1225 square feet (113.8 sq m) and major motion coverage of 2500 square feet (232.3 sq m) with mounting height of 6 to 8 feet (1.6 to 2.4 m); 90 degree field of view.
4) Hallway Occupancy/Vacancy Sensor; Lutron Radio Powr Savr Series, Model LFR2-OHLB-P-WH: Major motion coverage of up to 150 feet (45.7 m) with mounting height of 6 to 8 feet (1.6 to 2.4 m); narrow field of view.

C. Wireless Daylight Sensors:
1. Product: Lutron Model LFR2-DCRB.
2. Open-loop basis for daylight sensor control scheme.
3. Stable output over temperature from 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C).
4. Partially shielded for accurate detection of available daylight to prevent fixture lighting and horizontal light component from skewing sensor detection.
5. Provide linear response from 0 to 10,000 footcandles.
6. Color: White.
7. Mounting:
   d. Provide surface mounting bracket compatible with drywall, plaster, wood, concrete, and compressed fiber ceilings.
   e. Provide all necessary mounting hardware and instructions for both temporary and permanent mounting.
   f. Provide temporary mounting means to allow user to check proper performance and relocate as needed before permanently mounting sensor. Temporary mounting method to be design for easy, damage-free removal.
8. Meets California Title 24 requirements.

1.3 ACCESSORIES

A. Emergency Lighting Interface:
1. Product: Lutron Model LUT-ELI.
2. Provides total system listing to UL 924 when used with lighting control system.
3. Senses all three phases of building power.
4. Provides an output to power panels or digital ballast interfaces if power on any phase fails and sends all lights controlled by these devices to 100 percent intensity. Lights to return to their previous intensities when normal power is restored.

5. Accepts a contact closure input from a fire alarm control panel.

B. Provide power supplies as indicated or as required to power system devices and accessories.
   1. Product(s):
      a. Junction box-mounted power supply for shades, keypads, and accessories, and for providing additional low voltage power to communication link; Lutron Model QSPS-J-1-50; with miswire and thermal protection.
      b. Plug-in power supply for shades, drapery drive units, keypads, and accessories, and for providing additional low voltage power to communication link; Lutron Model QSPS-P1-1-50; with miswire protection; powered from standard receptacle using cord 6 feet (1.8 m) in length.
      c. Ten output power supply panel for shades, drapery drive units, keypads and accessories, and for providing additional low voltage power to communication link; Lutron Model QSPS-P1-10-60.
      d. Power supply for keypads and accessories (not for shades/window treatments), and for providing additional low voltage power to communication link; Lutron Model STEP-PS.

1.4 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Factory Testing; Lutron Standard Factory Testing:
   1. Perform full-function factory testing on all completed assemblies. Statistical sampling is not acceptable.
   2. Perform full-function factory testing on 100 percent of all ballasts and LED drivers.
   3. Perform factory audit burn-in of all dimming assemblies and panels at 104 degrees F (40 degrees C) at full load for two hours.
   4. Perform factory burn-in of 100 percent of all ballasts at 104 degrees F (40 degrees C).

PART 2 - EXECUTION

2.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that ratings and configurations of system components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive system components.

D. Verify that conditions are satisfactory for installation prior to starting work.

2.2 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130.

B. Install products in accordance with manufacturer's instructions.

C. Provide dedicated network between lighting management system computer and lighting management hubs.

D. Define each dimmer/relay load type, assign each load to a zone, and set control functions.

E. Sensor Locations:
   1. Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "DIGITAL-NETWORK LIGHTING CONTROL SYSTEM - GENERAL REQUIREMENTS", locate sensors in accordance with layout provided by Lighting Control Manufacturer. Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated. Where Lighting Control Manufacturer Sensor Layout and Tuning service is not specified, locate sensors in accordance with Drawings.
   2. Sensor locations indicated are diagrammatic. Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage, in accordance with manufacturer's recommendations.

F. Mount exterior daylight sensors to point due north with constant view of daylight.

G. Ensure that daylight sensor placement minimizes sensor view of electric light sources. Locate ceiling-mounted and luminaire-mounted daylight sensors to avoid direct view of luminaires.

H. Automated Shade Control Sensors:
   1. Mount rooftop cloudy day sensors to point in the direction of each facade.
   3. Ensure that window shadow sensor placement provides an unobstructed view of outdoors. Do not place at a skylight or above indirect luminaires.

I. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

J. Lamp Lead Lengths: Do not exceed 3 feet for T4 4-pin compact and T5 BIAX lamps and 7 feet (2.1 m) for T5, T5-HO, T8 U-bend, and T8 linear fluorescent lamps.

K. LED Light Engine/Array Lead Length: Do not exceed 100 feet.

L. System and Network Integration Consultation; Lutron LSC-INT-VISIT: Include as part of the base bid; as an alternate to the base bid additional costs for Lighting Control Manufacturer to conduct meeting with facility representative and other related equipment manufacturers to discuss equipment and integration procedures.
   1. Coordinate scheduling of visit with Lighting Control Manufacturer. Manufacturer recommends that this visit be scheduled early in construction phase, after system purchase but prior to system installation.

M. Identify system components in accordance with Section 26 05 53.

2.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Manufacturer's Startup Services; Lutron Standard Startup Services:
   1. Manufacturer's authorized Service Representative to conduct minimum of two site visits to ensure proper system installation and operation.
   2. Conduct Pre-Installation visit to review requirements with installer as specified in Part 1 under "Administrative Requirements".
   3. Conduct second site visit upon completion of lighting control system to perform system startup and verify proper operation:
      a. Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under “DIGITAL-NETWORK LIGHTING CONTROL SYSTEM – GENERAL REQUIREMENTS”, authorized Service Representative to verify sensor locations, in accordance with layout provided by Lighting Control Manufacturer; Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated.
      b. Verify connection of power wiring and load circuits.
      c. Verify connection and location of controls.
      d. Energize lighting management hubs and download system data program.
      e. Address devices.
      f. Verify proper connection of panel links (low voltage/data) and address panel.
      g. Download system panel data to dimming/switching panels.
      h. Check dimming panel load types and currents and supervise removal of by-pass jumpers.
      i. Verify system operation control by control.
      j. Verify proper operation of manufacturer's interfacing equipment.
      k. Verify proper operation of manufacturer's supplied PC and installed programs.
      l. Configure initial groupings of ballast for wall controls, daylight sensors and occupancy sensors.
      m. Provide initial rough calibration of sensors; fine-tuning of sensors is responsibility of Contractor unless provided by Lighting Control Manufacturer as part of Sensor Layout and Tuning service where specified in

Part 2 under "DIGITAL-NETWORK LIGHTING CONTROL SYSTEM - GENERAL REQUIREMENTS".

n. Train County's representative on system capabilities, operation, and maintenance, as specified in Part 3 under "Closeout Activities".
o. Obtain sign-off on system functions.
p. After Hours Startup; Lutron LSC-AH-SU: Include as part of the base bid; as an alternate to the base bid to perform manufacturer's startup procedures outside normal working hours (Monday through Friday, 7am to 5pm).

C. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

2.4 ADJUSTING

A. On-Site Scene and Level Tuning; Lutron LSC-AF-VISIT: Include as part of the base bid; as an alternate to the base bid additional costs for Lighting Control Manufacturer to visit site to conduct meeting with County's representative to make required lighting adjustments to the system for conformance with original design intent.

B. Sensor Fine-Tuning: Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under “DIGITAL-NETWORK LIGHTING CONTROL SYSTEM – GENERAL REQUIREMENTS”, Lighting Control Manufacturer to provide up to two additional post-startup on-site service visits for fine-tuning of sensor calibration. Where Lighting Control Manufacturer Sensor Layout and Tuning service is not specified, Contractor to provide fine-tuning of sensor calibration.

2.5 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

2.6 COMMISSIONING

A. See Section 01 90 00 for commissioning requirements.

B. Title 24 Acceptance Testing Service; Lutron LSC-SPV-DOC-T24: Include as part of the base bid; as an alternate to the base bid additional costs for Lighting Control Manufacturer to perform lighting control acceptance testing in accordance with CAL TITLE 24 P6. Submit required documentation.

2.7 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Demonstration:
   1. On-Site Performance-Verification Walkthrough; Lutron LSC-WALK: Include as part of the base bid additional costs for lighting control manufacturer to provide on-site demonstration of system functionality to commissioning agent or facility representative.

D. Training:
   1. Include services of manufacturer's authorized Service Representative to perform on-site training of County's personnel on operation, adjustment, and maintenance of lighting control system as part of standard system start-up services.
      a. Include training on software to be provided:
         1) Configuration software used to make system programming and configuration changes.
         2) Control and monitor.
         3) Energy savings display software.
         4) Personal web-based control software.
   2. Customer-Site Solution Training Visit; Lutron LSC-TRAINING: Include as part of the base bid; as an alternate to the base bid additional costs for Lighting Control Manufacturer to provide one day(s) of additional on-site system training.

2.8 PROTECTION

A. Protect installed products from subsequent construction operations.

2.9 MAINTENANCE

A. See Section 01 70 00 - Execution Requirements, for additional requirements relating to maintenance service.

B. Software Maintenance Agreement; Lutron LSC-SMA: Include as an alternate to the base bid; additional costs for manufacturer to provide quarterly compatibility testing results for PC-based lighting control software and new patches issued for Microsoft Operating System, Database, and Browser tools.
   1. If new Microsoft patches create a software conflict, manufacturer to provide lighting control software patches to ensure continued operation.

C. System Optimization Visit; Lutron LSC-SYSOPT: Include as part of the base bid; as an alternate to the base bid additional costs for Lighting Control System Manufacturer to visit site six months after system start-up to evaluate system usage and discuss opportunities to make efficiency improvements that will fit with the current use of the facility.

END OF SECTION 26 09 43

SECTION 26 22 00

LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Distribution, dry-type transformers rated 600 V and less, with capacities up to 300 kVA.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type and size of transformer.
   2. Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer.

B. Shop Drawings:
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.
   3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Source quality-control reports.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Acme Electric Corporation.
   2. Controlled Power Company; an Emerson company.
   3. Eaton.
   4. Federal Pacific.
   5. General Electric Company.
   6. Hammond Power Solutions Inc.
   7. Siemens Power Transmission & Distribution, Inc.
   8. Sola/Hevi-Duty; a brand of Emerson Electric Co.
   9. Square D; by Schneider Electric.

B. Source Limitations: Obtain each transformer type from single source from single manufacturer.

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Transformers Rated 15 kVA and Larger: Comply with NEMA TP 1 energy-efficiency levels as verified by testing according to NEMA TP 2.

D. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.

E. Coils: Continuous windings without splices except for taps.
   1. Internal Coil Connections: Brazed or pressure type.
   2. Coil Material: Copper.

F. Encapsulation: Transformers smaller than 30 kVA shall have core and coils completely resin encapsulated.

G. Shipping Restraints: Paint or otherwise color code bolts, wedges, blocks, and other restraints that are to be removed after installation and before energizing. Use fluorescent colors that are easily identifiable inside the transformer enclosure.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NFPA 70, and list and label as complying with UL 1561.

B. Cores: One leg per phase.

C. Enclosure: Ventilated.
   1. NEMA 250, Type 2: Core and coil shall be encapsulated within resin compound to seal out moisture and air.
   2. KVA Ratings: Based on convection cooling only and not relying on auxiliary fans.

D. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.

E. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

F. Insulation Class, Smaller than 30 kVA: 185 deg C, UL-component-recognized insulation system with a maximum of 115-deg C rise above 40-deg C ambient temperature.

G. Insulation Class, 30 kVA and Larger: 220 deg C, UL-component-recognized insulation system with a maximum of 80-deg C rise above 40-deg C ambient temperature.

H. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for nonsinusoidal load current-handling capability to the degree defined by designated K-factor.
   1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
   2. Indicate value of K-factor on transformer nameplate.
   3. Unit shall meet requirements of NEMA TP 1 when tested according to NEMA TP 2 with a K-factor equal to one.

I. Wall Brackets: Manufacturer's standard brackets where transformers are shown to be wall mounted on the drawings.

J. Sound-Level Requirements: Average sound levels when factory tested according to NEMA ST 20 -2014.

2.4 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 26 05 53 "Identification for Electrical Systems."

2.5 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.01 and IEEE C57.12.91.
   1. Resistance measurements of all windings at the rated voltage connections and at all tap connections.
   2. Ratio tests at the rated voltage connections and at all tap connections.
   3. Phase relation and polarity tests at the rated voltage connections.
   4. No load losses, and excitation current and rated voltage at the rated voltage connections.
   5. Impedance and load losses at rated current and rated frequency at the rated voltage connections.
   6. Applied and induced tensile tests.
   7. Regulation and efficiency at rated load and voltage.
   8. Insulation Resistance Tests:
      a. High-voltage to ground.
      b. Low-voltage to ground.
      c. High-voltage to low-voltage.
   9. Temperature tests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

E. Environment: Enclosures shall be rated for the environment in which they are located. Covers for NEMA 250, Type 4X enclosures shall not cause accessibility problems.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall-mounted transformers level and plumb with standard wall brackets provided by transformer manufacturer.
   1. Coordinate installation of wall-mounted transformers with wall structure reinforcing, and with actual transformer provided.

B. Construct concrete bases according to Section 03 30 53 "Miscellaneous Cast-in-Place Concrete". Anchor floor-mounted transformers according to manufacturer's written instructions and requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems."
   1. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

C. Secure covers to enclosure and tighten all bolts to manufacturer-recommended torques to reduce noise generation.

D. Remove shipping bolts, blocking, and wedges.

3.3 CONNECTIONS

A. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

D. Provide flexible connections at all conduit and conductor terminations and supports to eliminate sound and vibration transmission to the building structure.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS for dry-type, air-cooled, low-voltage transformers. Certify compliance with test parameters.

C. Remove and replace units that do not pass tests or inspections and retest as specified above.

D. Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of transformer connections.
   1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
   2. Perform two follow-up infrared scans of transformers, one at four months and the other at 11 months after Substantial Completion.
   3. Prepare a certified report identifying transformer checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.

E. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.5 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 5 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Connect buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus 5 percent, at secondary terminals.

C. Output Settings Report: Prepare a written report recording output voltages and tap settings.

3.6 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 26 22 00

SECTION 26 24 13

SWITCHBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Related Requirements:
   1. Section 26 43 13, Surge Protection for Low-Voltage Electrical Power Circuits.

1.2 SUMMARY

A. Section Includes:
   1. Service and distribution switchboards rated 600 V and less.
   2. Surge protection devices.
   3. Disconnecting and overcurrent protective devices.
   4. Instrumentation.
   5. Control power.
   6. Accessory components and features.
   7. Identification.

1.3 ACTION SUBMITTALS

A. Product Data: For each switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component.
   1. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

B. Shop Drawings: For each switchboard and related equipment.
   1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
   2. Detail enclosure types for types other than NEMA 250, Type 1.
   3. Detail bus configuration, current, and voltage ratings.
   4. Detail short-circuit current rating of switchboards and overcurrent protective devices. Include a preliminary fault current study and equipment evaluation report.
   5. Detail utility company's metering provisions with indication of approval by utility company.
   6. Include evidence of NRTL listing for series rating of installed devices.
   7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

1.4 INFORMATIONAL SUBMITTALS

A. Field Quality-Control Reports:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals.
   1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
      a. Routine maintenance requirements for switchboards and all installed components.
      b. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
      c. Final fault current, coordination, and arc flash studies with final equipment evaluation report, adjustable overcurrent device settings, and arc flash labels for all equipment.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Potential Transformer Fuses: Equal to 10 percent of quantity installed for each size and type but no fewer than two of each size and type.
   2. Control-Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.

B. Remove loose packing and flammable materials from inside switchboards and install temporary electric heating (250 W per section) if necessary to prevent condensation.

C. Handle and prepare switchboards for installation according to NECA 400, NEMA PB 2.1.

1.9 FIELD CONDITIONS

A. Environmental Limitations:
   1. Do not deliver or install switchboards until spaces are enclosed and weather tight, wet work in spaces is complete and dry, work above switchboards is complete, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
   2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
      a. Ambient Temperature: Not exceeding 104 deg F.
      b. Altitude: Not exceeding 6600 feet.

1.10 COORDINATION

A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buswork, overcurrent protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Three years from date of Substantial Completion.

B. Manufacturer's Warranty: Manufacturer's agrees to repair or replace surge protection devices that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 SWITCHBOARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Cutlet Hammer - Eaton.
   2. General Electric Company.
   3. Siemens Power Transmission & Distribution, Inc.
   4. Schneider Electric (Square-D).

B. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 2.

E. Comply with NFPA 70.

F. Comply with UL 891.

G. Front-Connected, Front-Accessible Switchboards:
   1. Main Devices: Fixed, individually mounted.
   2. Branch Devices: Panel mounted. Large feeders may be individually mounted.
   3. Sections rear aligned.

H. Indoor Enclosures: Steel, NEMA 250, Type 1.

I. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

J. Customer Metering: Provide separate customer metering for LEED measurement and verification as indicated on the drawings.

K. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.
   1. Removable covers shall form top, front, and sides. Top covers shall be easily removable for drilling and cutting.
   2. Cable supports shall be arranged to facilitate cabling and adequate to support cables indicated, including those for future installation.

L. Buses and Connections: Three phase, four wire.
   1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.
   2. Phase- and Neutral-Bus Material: Tin-plated, high-strength, electrical-grade aluminum alloy with tin-plated aluminum circuit-breaker line connections.
   3. Tin-plated aluminum feeder circuit-breaker line connections.
   4. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with compression connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.
   5. Ground Bus: 1/4-by-2-inch hard-drawn copper of 98 percent conductivity, equipped with compression connectors for feeder and branch-circuit ground conductors.

6. Main-Phase Buses and Equipment-Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
7. Disconnect Links:
   a. Isolate neutral bus from incoming neutral conductors.
   b. Bond neutral bus to equipment-ground bus for switchboards utilized as service equipment or separately derived systems.
8. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with compression connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.

M. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

2.2 SURGE PROTECTION DEVICES

A. Refer to Section 26 43 13.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
   1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
   2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
   3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
      a. Instantaneous trip.
      b. Long- and short-time pickup levels.
      c. Long and short time adjustments.
      d. Ground-fault pickup level, time delay, and I^2t response.
   4. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
   5. MCCB Features and Accessories:
      a. Standard frame sizes, trip ratings, and number of poles.
      b. Lugs: Compression style where available, suitable for number, size, trip ratings, and conductor material.
      c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
      d. Ground-Fault Protection: Relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

e. Communication Capability: Communication module with functions and features compatible with power monitoring and control system specified in Section 260913 "Electrical Power Monitoring and Control."
f. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
g. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.

2.4 INSTRUMENTATION

A. Instrument Transformers: NEMA EI 21.1, and the following:
1. Potential Transformers: NEMA EI 21.1; 120 V, 60 Hz, disconnecting type with integral fuse mountings. Burden and accuracy shall be consistent with connected metering and relay devices.
2. Current Transformers: NEMA EI 21.1; 5 A, 60 Hz, secondary; bar or window type; secondary winding and secondary shorting device. Burden and accuracy shall be consistent with connected metering and relay devices.
3. Control-Power Transformers: Dry type, mounted in separate compartments for units larger than 3 kVA.
4. Current Transformers for Neutral and Ground-Fault Current Sensing: Connect secondary wiring to ground overcurrent relays, via shorting terminals, to provide selective tripping of main and tie circuit breaker. Coordinate with feeder circuit-breaker, ground-fault protection.

B. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:
1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:
a. Phase Currents, Each Phase: Plus or minus 0.5 percent.
b. Phase-to-Phase Voltages, Three Phase: Plus or minus 0.5 percent.
c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 0.5 percent.
d. Megawatts: Plus or minus 1 percent.
e. Megavars: Plus or minus 1 percent.
f. Power Factor: Plus or minus 1 percent.
g. Frequency: Plus or minus 0.1 percent.
h. Accumulated Energy, Megawatt Hours: Plus or minus 1 percent; accumulated values unaffected by power outages up to 72 hours.
i. Megawatt Demand: Plus or minus 1 percent; demand interval programmable from five to 60 minutes.
j. Contact devices to operate remote impulse-totalizing demand meter.
2. Mounting: Display and control unit flush or semiflush mounted in instrument compartment door.

C. Impulse-Totalizing Demand Meter:
1. Comply with ANSI C12.1.

2. Suitable for use with switchboard watt-hour meter, including two-circuit totalizing relay.
3. Cyclometer.
4. Four-dial, totalizing kilowatt-hour register.
5. Positive chart drive mechanism.
6. Capillary pen holding a minimum of one month's ink supply.
7. Roll chart with minimum 31-day capacity; appropriate multiplier tag.
8. Capable of indicating and recording [five] [15] [30] <Insert time period>-minute integrated demand of totalized system.

2.5 CONTROL POWER

A. Control Circuits: 120-V ac, supplied through secondary disconnecting devices from control-power transformer.

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Mounting Accessories: For anchors, mounting channels, bolts, washers, and other mounting accessories, comply with manufacturer's instructions.

2.7 IDENTIFICATION

A. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store switchboards according to NEMA PB 2.1.
   1. Lift or move switchboards with spreader bars and manufacturer-supplied lifting straps following manufacturer's instructions.
   2. Use rollers, slings, or other manufacturer-approved methods if lifting straps are not furnished.
   3. Protect from moisture, dust, dirt, and debris during storage and installation.
   4. Install temporary heating during storage per manufacturer's instructions.

B. Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged.

C. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work or that affect the performance of the equipment.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install switchboards and accessories according to NEMA PB 2.1.

B. Equipment Mounting: Install switchboards on concrete base, 4-inch nominal thickness. Comply with requirements for concrete base specified in Section 03 30 00 "Cast-in-Place Concrete."
   1. Install conduits entering underneath the switchboard, entering under the vertical section where the conductors will terminate. Install with couplings flush with the concrete base. Extend 2 inches above concrete base after switchboard is anchored in place.
   2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
   3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
   4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   5. Install anchor bolts to elevations required for proper attachment to switchboards.
   6. Anchor switchboard to building structure at the top of the switchboard if required or recommended by the manufacturer.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, straps and brackets, and temporary blocking of moving parts from switchboard units and components.

D. Install filler plates in unused spaces of panel-mounted sections.

E. Install overcurrent protective devices, surge protection devices, and instrumentation.
   1. Set field-adjustable switches and circuit-breaker trip ranges per final approved coordination study. Refer to Section 26 05 73, Fault Current, Coordination, and Arc Flash Studies.

F. Comply with NECA 1.

3.3 CONNECTIONS

A. Bond conduits entering underneath the switchboard to the equipment ground bus with a bonding conductor sized per NFPA 70.

B. Support and secure conductors within the switchboard according to NFPA 70.

3.4 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

D. Apply Arc Flash label provided under Section 26 05 73, Fault Current, Coordination, and Arc Flash Studies.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. Acceptance Testing:
      a. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within the switchboard, and remove neutral connection to surge protection and other electronic devices prior to insulation test. Reconnect after test.
      b. Test continuity of each circuit.
   2. Test ground-fault protection of equipment for service equipment per NFPA 70.
   3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   4. Correct malfunctioning units on-site where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
   5. Perform the following infrared scan tests and inspections, and prepare reports:
      a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard. Remove front panels so joints and connections are accessible to portable scanner.
      b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchboard 11 months after date of Substantial Completion.
      c. Instruments and Equipment:
         1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
   6. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

B. Switchboard will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train County's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories, and to use and reprogram microprocessor-based trip, monitoring, and communication units.

END OF SECTION 26 24 13

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Distribution panelboards.
   2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

A. ATS: Acceptance testing specification.

B. GFCI: Ground-fault circuit interrupter.

C. GFEP: Ground-fault equipment protection.

D. MCCB: Molded-case circuit breaker.

E. SPD: Surge protective device.

F. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.
   1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
   2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.
   1. Include dimensioned plans, elevations, sections, and details.
   2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
   3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
   4. Detail bus configuration, current, and voltage ratings.

5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Include a preliminary fault current study and equipment evaluation report.
7. Include evidence of NRTL listing for series rating of installed devices.
8. Include evidence of NRTL listing for SPD as installed in panelboard.
9. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
10. Include wiring diagrams for power, signal, and control wiring.
11. Key interlock scheme drawing and sequence of operations.

1.5 INFORMATIONAL SUBMITTALS

A. Panelboard Schedules: For installation in panelboards.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
   1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
   2. Final fault current, coordination, and arc flash studies with final equipment evaluation report, adjustable overcurrent device settings, and arc flash labels for all equipment.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Keys: Two for each type of panelboard cabinet lock.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards.

B. Handle and prepare panelboards for installation according to NECA 407, NEMA PB 1.

1.10 FIELD CONDITIONS

A. Environmental Limitations:
   1. Do not deliver or install panelboards until spaces are enclosed and weather tight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and

humidity conditions at occupancy levels during the remainder of the construction period.

2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
   a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
   b. Altitude: Not exceeding 6600 feet.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
   1. Panelboard Warranty Period: 2 years from date of Substantial Completion.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace SPD that fails in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Eaton.
   2. ESL Power Systems, Inc.
   3. General Electric Company; GE Energy Management - Electrical Distribution.
   4. Siemens Energy.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA PB 1.

D. Comply with NFPA 70.

E. Enclosures: Surface-mounted, dead-front cabinets.
   1. Rated for environmental conditions at installed location.
      a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
   2. Height: 84 inches maximum.
   3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
   4. Finishes:

F. Phase, Neutral, and Ground Buses:
   1. Material: Tin-plated aluminum.
      a. Plating shall run entire length of bus.
      b. Bus shall be fully rated the entire length.
   2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
   3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
   4. Full-Sized Neutral: All panels shall be equipped with full-capacity neutral bus. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.

G. Conductor Connectors: Suitable for use with conductor material and sizes.
   1. Material: Tin-plated aluminum.
   2. Terminations shall allow use of 75 deg C rated conductors without derating.
   3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
   4. Main and Neutral Lugs: Compression type, with a lug on the neutral bar for each pole in the panelboard.
   5. Ground Lugs and Bus-Configured Terminators: Compression type, with a lug on the bar for each pole in the panelboard.
   6. Feed-Through Lugs: Where indicated on One Line Diagram or Panelboard Schedules provide compression type feed through lugs suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

H. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices in every available space.

I. Panelboard Fault Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include label or manual with size and type of allowable upstream and branch devices listed and labeled by an NRTL for series-connected short-circuit rating.

2.2 PERFORMANCE REQUIREMENTS

A. Surge Suppression: Where indicated on drawings provide factory-installed SPD as an integral part of indicated panelboards, complying with UL 1449 SPD Type 1.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. MCCB: Comply with UL 489, with series rating or fully rated to meet available fault currents.
   1. Thermal-Magnetic Circuit Breakers:
      a. Inverse time-current element for low-level overloads.
      b. Instantaneous magnetic trip element for short circuits.

c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip Circuit Breakers:
   a. RMS sensing.
   b. Field-replaceable rating plug or electronic trip.
   c. Digital display of settings, trip targets, and indicated metering displays.
   d. Multi-button keypad to access programmable functions and monitored data.
   e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
   f. Integral test jack for connection to portable test set or laptop computer.
   g. Field-Adjustable Settings:
      1) Instantaneous trip.
      2) Long- and short-time pickup levels.
      3) Long and short time adjustments.
4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
6. Features and Accessories:
   a. Standard frame sizes, trip ratings, and number of poles.
   b. Breaker handle indicates tripped status.
   c. UL listed for reverse connection without restrictive line or load ratings.
   d. Lugs: Suitable for number, size, trip ratings, and conductor materials.
   e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
   f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
   g. Shunt Trip: 24-V trip coil energized from separate circuit.
   h. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in off position.

2.4 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.
   1. Computer-generated circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

2.5 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store panelboards according to NECA 407], NEMA PB 1.1.

C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Comply with NECA 1.

C. Install panelboards and accessories according to NECA 407, NEMA PB 1.1.

D. Equipment Mounting:

E. Mount panelboard cabinet plumb and rigid without distortion of box.

F. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

G. Mount surface-mounted panelboards to steel slotted supports 1 1/4 inch in depth.

H. Install overcurrent protective devices and controllers not already factory installed.
   1. Set field-adjustable, circuit-breaker trip ranges per device settings in the final coordination study.
   2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

I. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

J. Install filler plates in unused spaces.

K. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems."

B. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

C. Apply Arc Flash Labels provided under Section 26 05 73, Fault Current, Coordination, and Arc Flash Studies

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:
   1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

C. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers and low-voltage surge arrestors stated in NETA ATS, Paragraph 7.6 Circuit Breakers and Paragraph 7.19.1 Surge Arrestors, Low-Voltage. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 05 73 "Overcurrent Protective Device Coordination Study."

END OF SECTION 26 24 16

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Straight-blade convenience receptacles.
   2. GFCI receptacles.
   3. Twist-locking receptacles.
   4. Cord and plug sets.
   5. Toggle switches.
   6. Wall switch sensor light switches with dual technology sensors.
   7. Wall-box dimmers.
   8. Wall plates.

B. Related Sections include the following:
   1. Section 26 09 23, “Lighting Control Devices” for Photoelectric Switches, Occupancy Sensors, and Emergency Relays.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for marking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
   1. Connectors shall comply with UL 2459 and shall be made with stranded building wire.
   2. Devices shall comply with the requirements in this Section.

D. Devices for County-Furnished Equipment:
   1. Receptacles: Match plug configurations.
   2. Cord and Plug Sets: Match equipment requirements.

E. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STRAIGHT-BLADE RECEPTACLES

A. Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

2.3 GFCI RECEPTACLES

A. General Description:
   1. 125 V, 20 A, straight blade, feed through and non-feed-through type.
   2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
   3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
   4. Receptacles used in weatherproof boxes shall have weather resistant “WR” marking on face as required by UL Standard.

2.4 TWIST-LOCKING RECEPTACLES

A. Twist-Lock, Duplex and Single Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.

2.5 PENDANT CORD-CONNECTOR DEVICES

A. Description:
   1. Matching, locking-type plug and receptacle body connector.
   2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
   3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.

2.6 CORD AND PLUG SETS

A. Description:
   1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
   2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
   3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.7 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

2.8 WALL SWITCH SENSOR LIGHT SWITCH, DUAL TECHNOLOGY

A. Description: Switchbox-mounted, combination lighting-control sensor and conventional switch lighting-control unit using dual technology.
   1. Connections: Hard wired or wireless.
   2. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 A at 277-V ac for fluorescent or LED lighting, and 1/4 hp at 120-V ac.
   3. Adjustable time delay.
   4. Able to be switched from Automatic-On to Manual-On mode.
   5. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc.
   6. Comply with NEMA WD 1, UL 20, and FS W-S-896.

2.9 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.

C. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

D. LED Lamp Dimmer Switches: Modular; compatible with LED lamps/drivers; trim potentiometer to adjust low-end dimming; capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.10 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.
   1. Plate-Securing Screws: Metal with head color to match plate finish.
   2. Material for Finished Spaces: Steel with white baked enamel, suitable for field painting.
   3. Material for Unfinished Spaces: Galvanized steel.
   4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-proof while-in-use type, die-cast aluminum, with lockable cover.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:
   1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
   2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint will be troweled flush with the face of the wall.
   4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
   1. Do not strip insulation from conductors until they are being spliced or terminated on devices.
   2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Device Installation:
   1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
   2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
   3. Do not remove surface protection, such as plastic film and smudge covers until finished space is being occupied.
   4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
   5. Use a torque screwdriver when a torque is recommended or required by manufacturer.
   6. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
   7. Tighten unused terminal screws on the device.

E. Receptacle Orientation:
   1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:
   1. Install dimmers within terms of their listing.
   2. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 26 05 53 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with contrasting letter color on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

C. Perform the following tests and inspections:
   1. Test Instruments: Use instruments that comply with UL 1436.
   2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

D. Tests for Convenience Receptacles:
   1. Line Voltage: Acceptable range is 105 to 132 V.
   2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
   3. Ground Impedance: Values of up to 2 ohms are acceptable.
   4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
   5. Using the test plug, verify that the device and its outlet box are securely mounted.
   6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

E. Wiring device will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 26 27 26

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Fusible switches.
   2. Nonfusible switches.
   3. Receptacle switches.
   4. Shunt trip switches.
   5. Molded-case circuit breakers (MCCBs).
   6. Molded-case switches.
   7. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
   1. Enclosure types and details for types other than NEMA 250, Type 1.
   2. Current and voltage ratings.
   3. Short-circuit current ratings (interrupting and withstand, as appropriate).
   4. Include evidence of NRTL listing for series rating of installed devices.
   5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
   6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
   1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

B. Manufacturer's field service report.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
   1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
   2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
   1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
   2. Altitude: Not exceeding 6600 feet.

1.9 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Type HD, Heavy Duty, Single Throw, [240] [600]-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate [specified] [indicated] fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

B. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
   2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
   3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
   4. Lugs: Compression type, suitable for number, size, and conductor material.

2.2 NONFUSIBLE SWITCHES

A. Type HD, Heavy Duty, Single Throw, [240] [600]-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

B. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
   2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
   3. Lugs: Compression type, suitable for number, size, and conductor material.

2.3 SHUNT TRIP SWITCHES

A. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with 200-kA interrupting and short-circuit current rating when fitted with Class J fuses.

B. Switches: Three-pole, horsepower rated, with integral shunt trip mechanism and Class J fuse block; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

C. Control Circuit: 24-V dc; obtained from fire alarm system.

D. Accessories:
   1. Oiltight key switch for key-to-test function.
   2. Oiltight ON pilot light.
   3. Isolated neutral lug; 100 percent rating.
   4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
   5. Form C alarm contacts that change state when switch is tripped.
   6. Three-pole, double-throw, fire-safety and alarm relay; 24-V dc coil voltage.
   7. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.

2.4 MOLDED-CASE CIRCUIT BREAKERS

A. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

B. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

C. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

D. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
   1. Instantaneous trip.
   2. Long- and short-time pickup levels.
   3. Long- and short-time time adjustments.
   4. Ground-fault pickup level, time delay, and I^2t response.

E. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

2.5 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
   1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
   2. Outdoor Locations: NEMA 250, Type 3R.
   3. Kitchen - Wash-Down Areas: NEMA 250, Type 4X.
   4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
   5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Comply with mounting and anchoring requirements specified in Section 26 05 48.16 "Seismic Controls for Electrical Systems."

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."
   1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
   2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:
   1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

B. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
   3. Perform the following infrared scan tests and inspections and prepare reports:

      a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
      b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
      c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
   4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

C. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges and apply Arc Flash Labels as specified in Section 26 05 73 "Fault Current, Coordination, and Arc Flash Studies."

END OF SECTION 26 28 16

SECTION 26 29 13

ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes the following enclosed controllers rated 600 V and less:
   1. Full-voltage manual.
   2. Full-voltage magnetic.

B. Related Section:
   1. Section 26 29 23 "Variable-Frequency Motor Controllers" for general-purpose, ac, adjustable-frequency, pulse-width-modulated controllers for use on variable torque loads in ranges up to 200 hp.

1.3 DEFINITIONS

A. CPT: Control power transformer.

B. MCCB: Molded-case circuit breaker.

C. MCP: Motor circuit protector.

D. N.C.: Normally closed.

E. N.O.: Normally open.

F. OCPD: Overcurrent protective device.

G. SCR: Silicon-controlled rectifier.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed controller. Include manufacturer's technical data on features, performance, electrical characteristics, ratings, and enclosure types and finishes.

B. Shop Drawings: For each enclosed controller. Include dimensioned plans, elevations, sections, details, and required clearances and service spaces around controller enclosures.

1. Show tabulations of the following:
   a. Each installed unit's type and details.
   b. Factory-installed devices.
   c. Nameplate legends.
   d. Short-circuit current rating of integrated unit.
   e. Listed and labeled for integrated short-circuit current (withstand) rating of OCPDs in combination controllers by an NRTL acceptable to authorities having jurisdiction.
   f. Features, characteristics, ratings, and factory settings of individual OCPDs in combination controllers.
2. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed controllers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
   1. Routine maintenance requirements for enclosed controllers and installed components.
   2. Manufacturer's written instructions for testing and adjusting circuit breaker and MCP trip settings.
   3. Manufacturer's written instructions for setting field-adjustable overload relays.
   4. Manufacturer's written instructions for testing, adjusting, and reprogramming reduced-voltage solid-state controllers.

1.7 MATERIALS MAINTENANCE SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
   2. Indicating Lights: Two of each type and color installed.
   3. Power Contacts: Furnish three spares for each size and type of magnetic contactor installed.

1.8 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. IEEE Compliance: Fabricate and test enclosed controllers according to IEEE 344 to withstand seismic forces defined in Section 26 05 48.16 "Seismic Controls for Electrical Systems."

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

B. If stored in areas subject to weather, cover enclosed controllers to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers; install temporary electric heating, with at least 250 W per controller.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
   1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
   2. Altitude: Not exceeding 6600 feet.

1.11 COORDINATION

A. Coordinate layout and installation of enclosed controllers with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 FULL-VOLTAGE CONTROLLERS

A. General Requirements for Full-Voltage Controllers: Comply with NEMA ICS 2, general purpose, Class A.

B. Motor-Starting Switches: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off or on.

C. Fractional Horsepower Manual Controllers: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.
   1. Configuration: Nonreversing or Two speed as required.
   2. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor; melting alloy type.
   3. Surface mounting.
   4. Red pilot light.
   5. Additional Nameplates: Provide additional nameplates for operator such as “on-off”, “up-down”, or “open-close” consistent with the equipment being controlled.

D. Magnetic Controllers: Full voltage, across the line, electrically held.
   1. Configuration: Nonreversing, Reversing, or two speed as required for the equipment.
   2. Contactor Coils: Pressure-encapsulated type.
   3. Power Contacts: Totally enclosed, double-break, silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
   4. Control Circuits: 24-V ac; obtained from integral CPT, with primary and secondary fuses, with CPT of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.
   5. Melting Alloy Overload Relays:
      a. Inverse-time-current characteristic.
      b. Class 10 tripping characteristic.
      c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.

E. Combination Magnetic Controller: Factory-assembled combination of magnetic controller, OCPD, and disconnecting means.
   1. Fusible Disconnecting Means:
      a. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate Class J fuses.
      b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
   2. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.

3. Nonfusible Disconnecting Means:
   a. NEMA KS 1, heavy-duty, horsepower-rated, nonfusible switch.
   b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
   c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.
4. MCCB Disconnecting Means:
   a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
   b. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
   c. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
   d. Auxiliary contacts "a" and "b" arranged to activate with MCCB handle.
   e. N.C. and N.O. alarm contact that operate when MCCB has tripped.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and surfaces to receive enclosed controllers, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine enclosed controllers before installation. Reject enclosed controllers that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Wall-Mounted Controllers: Install enclosed controllers on walls with tops at uniform height unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Section 26 05 29 "Hangers and Supports for Electrical Systems."

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in each fusible-switch enclosed controller.

D. Install fuses in control circuits if not factory installed. Comply with requirements in Section 26 28 13 "Fuses."

E. Install heaters in thermal overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.

F. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify enclosed controllers, components, and control wiring. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
   1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
   2. Label each enclosure with engraved nameplate.
   3. Label each enclosure-mounted control and pilot device.

3.4 CONTROL WIRING INSTALLATION

A. Install wiring between enclosed controllers and remote devices and facility's central control system. Comply with requirements in Section 26 05 23 "Control-Voltage Electrical Power Cables."

B. Bundle, train, and support wiring in enclosures.

C. Connect selector switches and other automatic-control selection devices where applicable.
   1. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switch is in manual-control position.
   2. Connect selector switches with enclosed-controller circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:
   1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

C. Tests and Inspections:
   1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
   2. Test insulation resistance for each enclosed-controller element, component, connecting motor supply, feeder, and control circuits.
   3. Test continuity of each circuit.

4. Verify that voltages at controller locations are within plus or minus 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Construction Manager before starting the motor(s).
5. Test each motor for proper phase rotation.
6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
8. Perform the following infrared (thermographic) scan tests and inspections and prepare reports:
    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each multi-pole enclosed controller. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each multi-pole enclosed controller 11 months after date of Substantial Completion.
    c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
9. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed controllers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports including a certified report that identifies enclosed controllers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

B. Adjust overload-relay heaters or settings if power factor correction capacitors are connected to the load side of the overload relays.

C. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable instantaneous trip elements. Initially adjust to six times the motor nameplate full-load ampere ratings and attempt to start motors several times, allowing for motor cooldown between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum

settings do not allow starting of a motor, notify Construction Manager before increasing settings.

D. Set field-adjustable switches and program microprocessors for required start and stop sequences in reduced-voltage solid-state controllers.

E. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 05 73 "Overcurrent Protective Device Coordination Study."

3.7 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until enclosed controllers are ready to be energized and placed into service.

B. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.8 DEMONSTRATION

A. Train County's maintenance personnel to adjust, operate, and maintain enclosed controllers.

END OF SECTION 26 29 13

SECTION 26 29 23

VARIABLE-FREQUENCY MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes solid-state, PWM, VFCs for speed control of three-phase, squirrel-cage induction motors.

1.3 DEFINITIONS

A. BMS: Building management system.

B. IGBT: Integrated gate bipolar transistor.

C. LAN: Local area network.

D. PID: Control action, proportional plus integral plus derivative.

E. PWM: Pulse-width modulated.

F. VFC: Variable frequency controller.

1.4 SUBMITTALS

A. Product Data: For each type of VFC. Include dimensions, mounting arrangements, location for conduit entries, shipping and operating weights, and manufacturer's technical data on features, performance, electrical ratings, characteristics, and finishes.

B. Shop Drawings: For each VFC.
   1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:
      a. Each installed unit's type and details.
      b. Nameplate legends.
      c. Short-circuit current rating of integrated unit.
   2. Wiring Diagrams: Power, signal, and control wiring for VFCs. Provide schematic wiring diagram for each type of VFC.

C. Coordination Drawings: Floor plans, drawn to scale, showing dimensioned layout, required working clearances, and required area above and around VFCs where pipe and ducts are prohibited. Show VFC layout and relationships between electrical components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate field measurements.

D. Qualification Data: For manufacturer.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For VFCs, all installed devices, and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
   1. Routine maintenance requirements for VFCs and all installed components.
   2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

G. Load-Current and Overload-Relay Heater List: Compile after motors have been installed and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.

H. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed and arrange to demonstrate that dip switch settings for motor running overload protection suit actual motor to be protected.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 100 miles of Project site, a service center capable of providing training, parts, and emergency maintenance and repairs.

B. Source Limitations: Obtain VFCs of a single type through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 - 2008, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NFPA 70 - 2008.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store VFCs indoors in clean, dry space with uniform temperature to prevent condensation. Protect VFCs from exposure to dirt, fumes, water, corrosive substances, and physical damage.

B. Cover VFCs to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers; install electric heating of sufficient wattage to prevent condensation.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation, capable of driving full load without derating, under the following conditions, unless otherwise indicated:
   1. Ambient Temperature: 0 to 40 deg C.
   2. Humidity: Less than 90 percent (noncondensing).
   3. Altitude: Not exceeding 4500 feet.

B. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by County or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
   1. Notify Construction Manager no fewer than two days in advance of proposed interruption of electrical service.
   2. Indicate method of providing temporary electrical service.
   3. Do not proceed with interruption of electrical service without Construction Manager's written permission.

1.8 COORDINATION

A. Coordinate layout and installation of VFCs with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

D. Coordinate features of VFCs, installed units, and accessory devices with pilot devices and control circuits to which they connect.

E. Coordinate features, accessories, and functions of each VFC and each installed unit with ratings and characteristics of supply circuit, motor, required control sequence, and duty cycle of motor and load.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. ABB Power Distribution, Inc.; ABB Control, Inc. Subsidiary.
   2. Baldor Electric Company (Graham).
   3. Danfoss Inc.; Danfoss Electronic Drives Div.
   4. General Electric Company; GE Industrial Systems.
   5. Rockwell Automation; Allen-Bradley Co.; Industrial Control Group.
   6. Siemens Energy and Automation; Industrial Products Division.
   7. Square D.
   8. Toshiba International Corporation.

2.2 VARIABLE FREQUENCY CONTROLLERS

A. Description: NEMA ICS 2, IGBT, PWM, VFC; listed and labeled as a complete unit and arranged to provide variable speed of an NEMA MG 1, Design B, 3-phase induction motor by adjusting output voltage and frequency.
   1. Provide unit suitable for operation of premium-efficiency motor as defined by NEMA MG 1.

B. Design and Rating: Match load type such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.

C. Output Rating: 3-phase; 6 to 60 Hz, with voltage proportional to frequency throughout voltage range.

D. Unit Operating Requirements:
   1. Input ac voltage tolerance of 208 V, plus or minus 5 or 380 to 500 V, plus or minus 10.
   2. Input frequency tolerance of 50/60 Hz, plus or minus 6 percent.
   3. Minimum Efficiency: 96 percent at 60 Hz, full load.
   4. Minimum Displacement Primary-Side Power Factor: 96 percent.
   5. Overload Capability: 1.1 times the base load current for 60 seconds; 2.0 times the base load current for 3 seconds.
   6. Starting Torque: 100 percent of rated torque or as indicated.
   7. Speed Regulation: Plus or minus 1 percent.

E. Isolated control interface to allow controller to follow control signal over an 11:1 speed range.
   1. Electrical Signal: 4 to 20 mA at 24 V.
   2. Pneumatic Signal: 3 to 15 psig (20 to 104 kPa).

F. Internal Adjustability Capabilities:
   1. Minimum Speed: 5 to 25 percent of maximum rpm.
   2. Maximum Speed: 80 to 100 percent of maximum rpm.
   3. Acceleration: 2 to a minimum of 22 seconds.
   4. Deceleration: 2 to a minimum of 22 seconds.
   5. Current Limit: 50 to a minimum of 110 percent of maximum rating.

G. Self-Protection and Reliability Features:
   1. Input transient protection by means of surge suppressors.
   2. Under- and overvoltage trips; inverter overtemperature, overload, and overcurrent trips.
   3. Motor Overload Relay: Adjustable and capable of NEMA ICS 2, Class 10 performance.
   4. Notch filter to prevent operation of the controller-motor-load combination at a natural frequency of the combination.
   5. Instantaneous line-to-line and line-to-ground overcurrent trips.
   6. Loss-of-phase protection.
   7. Reverse-phase protection.
   8. Short-circuit protection.
   9. Motor overtemperature fault.

H. Multiple-Motor Capability: Controller suitable for service to multiple motors and having a separate overload relay and protection for each controlled motor. Overload relay shall shut off controller and motors served by it when overload relay is tripped.

I. Automatic Reset/Restart: Attempts three restarts after controller fault or on return of power after an interruption and before shutting down for manual reset or fault correction. Bidirectional autospeed search shall be capable of starting into rotating loads spinning in either direction and returning motor to set speed in proper direction, without damage to controller, motor, or load.

J. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped.

K. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.

L. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.

M. Input Line Conditioning: Provide harmonic mitigating reactors, filters, or isolation transformers as required to limit harmonic distortion of the input power source to less than 10% thd.

N. If controller output voltage exceeds motor pulse-withstand capability, consult manufacturer for options available for conditioning output voltage. Options may include line inductors, output limit filters, sine wave filters, and motor termination filters. Insert requirements in first paragraph below.

O. VFC Output Filtering: Provide if/as required for the specific motor being controlled.

P. Status Lights: Door-mounted LED indicators shall indicate the following conditions:
   1. Power on.
   2. Run.
   3. Overvoltage.
   4. Line fault.
   5. Overcurrent.
   6. External fault.

Q. Panel-Mounted Operator Station: Start-stop and auto-manual selector switches with manual speed control potentiometer and elapsed time meter.

R. Indicating Devices: Meters or digital readout devices and selector switch, mounted flush in controller door and connected to indicate the following controller parameters:
   1. Output frequency (Hz).
   2. Motor speed (rpm).
   3. Motor status (running, stop, fault).
   4. Motor current (amperes).
   5. Motor torque (percent).
   6. Fault or alarming status (code).
   7. PID feedback signal (percent).
   8. DC-link voltage (VDC).
   9. Set-point frequency (Hz).
   10. Motor output voltage (V).

S. Control Signal Interface:
   1. Provide BACnet input/output interface unless noted/required otherwise.
   2. Electric Input Signal Interface: A minimum of 2 analog inputs (0 to 10 V or 0/4-20 mA) and 6 programmable digital inputs.
   3. Remote Signal Inputs: Capability to accept any of the following speed-setting input signals from the BMS or other control systems:
      a. 0 to 10-V dc.
      b. 0-20 or 4-20 mA.
      c. Potentiometer using up/down digital inputs.
      d. Fixed frequencies using digital inputs.
      e. RS485.
      f. Keypad display for local hand operation.

4. Output Signal Interface:
   a. A minimum of 1 analog output signal (0/4-20 mA), which can be programmed to any of the following:
      1) Output frequency (Hz).
      2) Output current (load).
      3) DC-link voltage (VDC).
      4) Motor torque (percent).
      5) Motor speed (rpm).
      6) Set-point frequency (Hz).
5. Remote Indication Interface: A minimum of 2 dry circuit relay outputs (120-V ac, 1 A) for remote indication of the following:
   a. Motor running.
   b. Set-point speed reached.
   c. Fault and warning indication (overtemperature or overcurrent).
   d. PID high- or low-speed limits reached.

T. Communications: Provide an RS485 interface allowing VFC to be used with an external system within a multidrop LAN configuration. Interface shall allow all parameter settings of VFC to be programmed via BMS control. Provide capability for VFC to retain these settings within the nonvolatile memory.

U. Manual Bypass: Magnetic contactor arranged to safely transfer motor between controller output and bypass controller circuit when motor is at zero speed. Controller-off-bypass selector switch sets mode, and indicator lights give indication of mode selected. Unit shall be capable of stable operation (starting, stopping, and running), with motor completely disconnected from controller (no load).

V. Bypass Controller: NEMA ICS 2, reduced-voltage, nonreversing enclosed controller with soft-start capability in manual-bypass mode. Provide motor overload protection under both modes of operation with control logic that allows common start-stop capability in either mode.

W. Integral Disconnecting Means: NEMA AB 1, instantaneous-trip circuit breaker or NEMA KS 1, nonfusible switch with lockable handle.

X. Isolating Switch: Non-load-break switch arranged to isolate VFC and permit safe troubleshooting and testing, both energized and de-energized, while motor is operating in bypass mode.

Y. Remote Indicating Circuit Terminals: Mode selection, controller status, and controller fault.

2.3 ACCESSORIES

A. Devices shall be factory installed in controller enclosure, unless otherwise indicated.

B. Push-Button Stations, Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty type.

C. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.

D. Control Relays: Auxiliary and adjustable time-delay relays.

E. Standard Displays:
1. Output frequency (Hz).
2. Set-point frequency (Hz).
3. Motor current (amperes).
4. DC-link voltage (VDC).
5. Motor torque (percent).
6. Motor speed (rpm).
7. Motor output voltage (V).

F. Historical Logging Information and Displays:
1. Real-time clock with current time and date.
2. Running log of total power versus time.
3. Total run time.
4. Fault log, maintaining last four faults with time and date stamp for each.

G. Current-Sensing, Phase-Failure Relays for Bypass Controller: Solid-state sensing circuit with isolated output contacts for hard-wired connection; arranged to operate on phase failure, phase reversal, current unbalance of from 30 to 40 percent, or loss of supply voltage; with adjustable response delay.

2.4 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested VFCs before shipping.

PART 3 - EXECUTION

3.1 COMMISSIONING REQUIREMENTS

A. The Contractor is to include commissioning of the system as a part of his contract obligations. This includes ensuring that the approved equipment is:

B. Installed in accordance with the specification requirements and the manufacturer's written installation instructions.

C. Started, tested, adjusted and balanced to perform in accordance with the specified and approved conditions.
   1. System Testing:
      a. Provide Factory Acceptance Testing as required by Section 01 91 00 – Commissioning.
      b. Provide all necessary labor, materials and equipment to successfully complete all system testing necessary for building occupancy and County acceptance.
      c. Provide all necessary labor, materials and equipment to assist Contractors of other division to complete system testing necessary for building occupancy and County acceptance, wherever an inter-relationship between Division 26 and the work of other divisions exists.
      d. Tests shall be repeated as necessary until all occupancy and operation permits are granted and the County accepts the project.

D. Provide material and labor to perform start-up of each respective item of equipment and system prior to beginning of test, adjust and balance procedures.
   1. Provide labor to assist the County's Representative in acceptance review.
   2. Provide point-by-point system checkout. Submit results in tabulated form by system. Include this data as part of Operation and Maintenance Manuals.
   3. Provide information and assistance and cooperate with test, adjust and balance services.
   4. Comply strictly with manufacturer's recommended procedures in starting up mechanical systems.
   5. Provide such periodic continuing adjustment services as necessary to ensure proper functioning of mechanical systems until acceptance and up to 1 full year after date of County acceptance.

E. The Contractor is to include training of the County's operators and providing written operation and maintenance instructions as specified.
   1. Training of County's Operators:
      a. The County shall be given comprehensive training in the understanding of the systems and the operation and maintenance of each major piece of equipment.
      b. The Contractor shall be responsible for scheduling the training which shall start with classroom sessions followed by hands on training on each piece of equipment. Hands on training shall include start-up, operation in all modes possible, shut-down and any emergency procedures.

F. The Contractor is to provide the County's Representative with a written statement certifying that the system is installed in accordance with the contract document requirement, that the systems have been adjusted and balanced and that all fire and smoke stopping is done and are performing as specified. Any non-conformance shall be listed.

G. The Contractor shall demonstrate to the County's Representative that equipment and systems are performing as certified, when requested to do so.

H. Guarantee of Work:
   1. Where applicable, furnish manufacturer's written warranty for materials and equipment.
   2. Insert warranties in appropriate locations in operating and maintenance manuals.
   3. Materials and equipment, which have seasonal operation limitations, shall be guaranteed for one year from date of seasonally appropriate test, and acceptance in writing by the County.

3.2 EXAMINATION

A. Examine areas, surfaces, and substrates to receive VFCs for compliance with requirements, installation tolerances, and other conditions affecting performance.

B. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFC installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 APPLICATIONS

A. Select features of each VFC to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; and duty cycle of motor, controller, and load.

B. Select horsepower rating of controllers to suit motor controlled.

3.4 INSTALLATION

A. Comply with mounting and anchoring requirements specified in Division 26 Section "Hangers and Supports for Electrical Systems."

B. Controller Fuses: Install fuses in each fusible switch. Comply with requirements in Division 26 Section "Fuses."

3.5 IDENTIFICATION

A. Identify VFCs, components, and control wiring according to Division 26 Section "Identification for Electrical Systems."

B. Operating Instructions: Frame printed operating instructions for VFCs, including control sequences and emergency procedures. Fabricate frame of finished metal, and cover instructions with clear acrylic plastic. Mount on front of VFC units.

3.6 CONNECTIONS

A. Conduit installation requirements are specified in other Division 26 Sections.

B. Ground equipment according to Division 26 "Grounding and Bonding for Electrical Systems."

3.7 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:
   1. Test insulation resistance for each enclosed controller element, bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to perform the following:
   1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
   2. Assist in field testing of equipment including pretesting and adjusting of solid-state controllers.
   3. Report results in writing.

C. Perform the following field tests and inspections and prepare test reports:
   1. Perform each electrical test and visual and mechanical inspection, except optional tests, stated in NETA ATS. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.8 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train County's maintenance personnel to adjust, operate, and maintain variable frequency controllers. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 26 29 23

SECTION 26 43 13

SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

B. Related Requirements:
   1. Section 26 24 13 "Switchboards" for factory-installed SPDs.
   2. Section 26 24 16 "Panelboards" for factory-installed SPDs.

1.3 DEFINITIONS

A. Inominal: Nominal discharge current.

B. MCOV: Maximum continuous operating voltage.

C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.

D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.

E. OCPD: Overcurrent protective device.

F. SCCR: Short-circuit current rating.

G. SPD: Surge protective device.

H. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For SPDs to include in maintenance manuals.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL SPD REQUIREMENTS

A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Comply with UL 1449.

D. MCOV of the SPD shall be the nominal system voltage.

2.2 SERVICE ENTRANCE SUPPRESSOR

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. ABB France.
   2. Advanced Protection Technologies Inc. (APT).
   3. Eaton Corporation.
   4. Emerson Electric Co.
   5. GE Zenith Controls.
   6. LEA International; Protection Technology Group.
   7. Leviton Manufacturing Co., Inc.
   8. PowerLogics, Inc.
   9. Schneider Electric Industries SAS.
   10. Siemens Industry, Inc.

11. Current Technology (T&B)

B. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Type 2
   1. SPDs with the following features and accessories:
      a. Integral disconnect switch (when connected directly to a bus).
      b. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
      c. Indicator light display for protection status.
      d. Form-C contacts rated at 2 A and 24-V ac, one normally open and one normally closed, for remote monitoring of protection status.

C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 240kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

D. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, three-phase, four-wire circuits shall not exceed the following:
   1. Line to Neutral: 1200 V for 480Y/277 V.
   2. Line to Ground: 1200 V for 480Y/277 V.
   3. Line to Line: 2000 V for 480Y/277 V.

E. SCCR: At least equal to 100 kA or that available (whichever is higher).

F. Inominal Rating: 20 kA.

2.3 PANEL SUPPRESSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. ABB France.
   2. Advanced Protection Technologies Inc. (APT).
   3. Eaton Corporation.
   4. Emerson Electric Co.
   5. GE Zenith Controls.
   6. LEA International; Protection Technology Group.
   7. Leviton Manufacturing Co., Inc.
   8. PowerLogics, Inc.
   9. Schneider Electric Industries SAS.
   10. Siemens Industry, Inc.
   11. Current Technology (T&B).

B. SPDs: Comply with UL 1449, Type 2.
   1. Include LED indicator lights for power and protection status.
   2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.

3. Include Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.

C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 100 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

D. Comply with UL 1283.

E. Protection modes and UL 1449 VPR for grounded wye circuits with 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:
1. Line to Neutral: 700 V for 208Y/120 V.
2. Line to Ground: 700 V for 208Y/120 V.
3. Neutral to Ground: 700 V for 208Y/120 V.
4. Line to Line: 1200 V for 208Y/120 V

F. SCCR: Equal or exceed 100 kA.

G. Inominal Rating: 20 kA.

2.4 ENCLOSURES

A. Indoor Enclosures: NEMA 250, Type 1.

B. Outdoor Enclosures: NEMA 250.

2.5 CONDUCTORS AND CABLES

A. Power Wiring: Same size as SPD leads, complying with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

B. Class 2 Control Cables: Multiconductor cable with copper conductors not smaller than No. 18 AWG, complying with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cables: Multiconductor cable with copper conductors not smaller than No. 14 AWG, complying with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.

C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

D. Use crimped connectors and splices only. Wire nuts are unacceptable.

E. Wiring:
   1. Power Wiring: Comply with wiring methods in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
   2. Controls: Comply with wiring methods in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.
   1. Compare equipment nameplate data for compliance with Drawings and Specifications.
   2. Inspect anchorage, alignment, grounding, and clearances.
   3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Complete startup checks according to manufacturer's written instructions.

B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.

C. Energize SPDs after power system has been energized, stabilized, and tested.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train County's maintenance personnel to operate and maintain SPDs.

END OF SECTION 26 43 13

SECTION 26 51 00

INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Interior lighting fixtures, lamps, and ballasts.
   2. Exit signs.
   3. Lighting fixture supports.
   4. Emergency fluorescent ballast

B. Related Sections:
   1. Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
   2. Section 26 27 26 "Wiring Devices" for manual wall-box dimmers for incandescent and LED lamps.

1.3 DEFINITIONS

A. BF: Ballast factor.

B. CCT: Correlated color temperature.

C. CRI: Color-rendering index.

D. HID: High-intensity discharge.

E. LER: Luminaire efficacy rating.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
   1. Physical description of lighting fixture including dimensions.

2. Ballast, including BF.
3. Energy-efficiency data.
4. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
5. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.
    a. Testing Agency Certified Data: For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by manufacturer.

B. Shop Drawings: For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.
    1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
    2. Wiring Diagrams: For power, signal, and control wiring.

C. Installation instructions.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
    1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910, complying with the IESNA Lighting Measurements Testing & Calculation Guides.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

D. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

1.7 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.

C. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.

D. Metal Parts: Free of burrs and sharp corners and edges.

E. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

G. Diffusers and Globes:
   1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
      a. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
      b. UV stabilized.
   2. Glass: Annealed crystal glass unless otherwise indicated.

H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
   1. Label shall include the following lamp and ballast characteristics:
      a. "USE ONLY" and include specific lamp type.

b. Lamp diameter code (T-4, T-5, T-8 etc.), tube configuration (twin, quad, triple, etc.), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
d. Start type (preheat, rapid start, instant start, etc.) for fluorescent and compact fluorescent luminaires.
e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
f. CCT and CRI for all luminaires.

2.3 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. General Requirements for Electronic Ballasts:
1. Comply with UL 935 and with ANSI C82.11.
2. Designed for type and quantity of lamps served.
3. Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.
4. Sound Rating: Class A.
5. Total Harmonic Distortion Rating: Less than 10 percent.
6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
7. Operating Frequency: 42 kHz or higher.
8. Lamp Current Crest Factor: 1.7 or less.
9. BF: 0.88 or higher.
10. Power Factor: 0.95 or higher.
11. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.

B. Luminaires controlled by occupancy sensors shall have programmed-start ballasts.

C. Electronic Programmed-Start Ballasts for T5, T8, and T5HO Lamps: Comply with ANSI C82.11 and the following:
1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
2. Automatic lamp starting after lamp replacement.

D. Single Ballasts for Multiple Lighting Fixtures: Factory wired with ballast arrangements and bundled extension wiring to suit final installation conditions without modification or rewiring in the field.

E. Ballasts for Low-Temperature Environments:
1. Temperatures 0 Deg F and Higher: Electronic type rated for 0 deg F starting and operating temperature with indicated lamp types.

F. Ballasts for Dimmer-Controlled Lighting Fixtures: Electronic type.
1. Dimming Range: 100 to 10 percent of rated lamp lumens.
2. Ballast Input Watts: Can be reduced to 20 percent of normal.

3. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.
4. Control: Coordinate wiring from ballast to control device to ensure that the ballast, controller, and connecting wiring are compatible.

2.4 BALLASTS FOR COMPACT FLUORESCENT LAMPS

A. Description: Electronic-programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
   1. Lamp end-of-life detection and shutdown circuit.
   2. Automatic lamp starting after lamp replacement.
   3. Sound Rating: Class A.
   4. Total Harmonic Distortion Rating: Less than 20 percent.
   5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
   6. Operating Frequency: 20 kHz or higher.
   7. Lamp Current Crest Factor: 1.7 or less.
   8. BF: 0.95 or higher unless otherwise indicated.
   9. Power Factor: 0.95 or higher.
   10. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

2.5 EMERGENCY FLUORESCENT POWER UNIT

A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.
   1. Emergency Connection: Operate one or two fluorescent lamp(s) continuously at an output of 3000 lumens per fixture. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
   2. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
      a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
      b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
   3. Battery: Sealed, maintenance-free, nickel-cadmium type.
   4. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
   5. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

B. External Type: Self-contained, modular, battery-inverter unit, suitable for powering one or more fluorescent lamps, remote mounted from lighting fixture. Comply with UL 924.
   1. Emergency Connection: Operate one fluorescent lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
   2. Nightlight Connection: Operate one fluorescent lamp in a remote fixture continuously.
   3. Battery: Sealed, maintenance-free, nickel-cadmium type.
   4. Charger: Fully automatic, solid-state, constant-current type.
   5. Housing: NEMA 250, Type 1 enclosure.
   6. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
   7. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
   8. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.6 BALLASTS FOR HID LAMPS

A. Electromagnetic Ballast for Metal-Halide Lamps: Comply with ANSI C82.4 and UL 1029. Include the following features unless otherwise indicated:
   1. Ballast Circuit: Constant-wattage autotransformer or regulating high-power-factor type.
   2. Minimum Starting Temperature: Minus 22 deg F for single-lamp ballasts.
   3. Rated Ambient Operating Temperature: 104 deg F.
   4. Open-circuit operation that will not reduce average life.
   5. Low-Noise Ballasts: Manufacturers' standard epoxy-encapsulated models designed to minimize audible fixture noise.

B. Electronic Ballast for Metal-Halide Lamps: Include the following features unless otherwise indicated:
   1. Minimum Starting Temperature: Minus 20 deg F for single-lamp ballasts.
   2. Rated Ambient Operating Temperature: 130 deg F.
   3. Lamp end-of-life detection and shutdown circuit.
   4. Sound Rating: Class A.
   5. Total Harmonic Distortion Rating: Less than 20 percent.
   6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
   7. Lamp Current Crest Factor: 1.5 or less.
   8. Power Factor: 0.90 or higher.
   9. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
   10. Protection: Class P thermal cutout.

2.7 QUARTZ LAMP LIGHTING CONTROLLER

A. General Requirements for Controllers: Factory installed by lighting fixture manufacturer. Comply with UL 1598.

B. Standby (Quartz Restrike): Automatically switches quartz lamp on when a HID lamp in the fixture is initially energized and during the HID lamp restrike period after brief power outages.

C. Connections: Designed for a single branch -circuit connection.

D. Switching Off: Automatically switches quartz lamp off when HID lamp strikes.

2.8 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
   1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.

2.9 FLUORESCENT LAMPS

A. T8 rapid-start lamps, rated 32 W maximum, nominal length of 48 inches, 2800 initial lumens (minimum), CRI 85 (minimum), color temperature 3500 K, and average rated life 20,000 hours unless otherwise indicated.

B. T5 rapid-start lamps, rated 28 W maximum, nominal length of 45.2 inches, 2900 initial lumens (minimum), CRI 85 (minimum), color temperature 3500 K, and average rated life of 20,000 hours unless otherwise indicated.

C. T5HO rapid-start, high-output lamps, rated 54 W maximum, nominal length of 45.2 inches, 5000 initial lumens (minimum), CRI 85 (minimum), color temperature 3500 K, and average rated life of 20,000 hours unless otherwise indicated.

D. Compact Fluorescent Lamps: 4-Pin, CRI 80 (minimum), color temperature 3500 K, average rated life of 10,000 hours at three hours operation per start, and suitable for use with dimming ballasts unless otherwise indicated.
   1. 13 W: T4, double or triple tube, rated 900 initial lumens (minimum).
   2. 18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).
   3. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
   4. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
   5. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
   6. 57 W: T4, triple tube, rated 4300 initial lumens (minimum).
   7. 70 W: T4, triple tube, rated 5200 initial lumens (minimum).

2.10 HID LAMPS

A. Pulse-Start, Metal-Halide Lamps: Minimum CRI 65, and color temperature 4000 K.

2.11 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

E. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

F. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures:
   1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
   2. Install lamps in each luminaire.

B. Temporary Lighting: If it is necessary, and approved by County's Representative, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.

C. Remote Mounting of Ballasts: Distance between the ballast and fixture shall not exceed that recommended by ballast manufacturer. Verify, with ballast manufacturers, maximum distance between ballast and luminaire.

D. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.
   1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches from lighting fixture corners.
   2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.

3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

E. Suspended Lighting Fixture Support:
   1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
   2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
   3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
   4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

F. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.2 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.3 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.
   1. Adjust aimable luminaires in the presence of County Representative.

END OF SECTION 26 51 00

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Exterior luminaires and accessories

B. Ballasts

C. Lamps and Light Sources

1.3 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by their basic designation only.
   1. American National Standards Institute (ANSI)
   2. ANSI C62.41.1-2002 – IEEE Guide on the Surge Environment in Low-Voltage (1000V and less) AC Power Circuits
   3. ANSI C62.41.2-2002 – IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000W and less) AC Power Circuits
   4. ANSI C82.SSL1 – SSL Drivers (in ANSI development)
   5. Illuminating Engineering Society of North America (IESNA)
   6. DG-13-98, Guide for the Selection of Photocontrols for Outdoor Lighting Applications
   7. G-1-03, Guidelines for Security Lighting
   8. LM-79-08, IESNA Approved Method for the Electrical and Photometric Measurements of Solid-Sate Lighting Products
   9. LM-80-08, IESNA Approved Method for Measuring Lumen Maintenance of LED Light Sources
   10. RP-33-99, Recommended Practice for Lighting for Exterior Environments
   11. TM-15-07 (Revised), Luminaire Classification System for Outdoor Luminaires
   12. International Electrotechnical Commission (IEC)
   13. IEC 60529 – Degrees of Protection provided by enclosures (IPCode)
   14. National Electrical Manufacturers Association (NEMA)
   15. ANSI/NEMA/ANSLG C78.377-2008 – American National Standard for the Chromaticity of Solid State Lighting Products.
   16. National Fire Protection Association (NFPA)
   17. NFPA 70 – National Electrical Code (NEC).

1.4 SUBMITTALS

A. Shop drawings: Clearly indicate fixture type, name of the job, and County's Representative. Contractor shall endeavor to submit all lighting fixture, lamp, and ballast shop drawings at one time, in one package. Any re-submittals shall include all fixtures, lamps, or ballasts previously rejected or requiring further information. Specialty fixtures, custom, or modified fixtures may be submitted as a separate package.

B. Product Data: Provide dimensions, ratings and specific catalog number and identification of items and accessories and performance data.

C. Catalog Cuts: If lacking sufficient detail to indicate compliance with contract documents, catalog cuts will not be accepted. This includes, but is not limited to, fixture type designation, manufacturer's complete catalog number, voltage, lamp type, specific ballast information, and any modifications necessary to meet the requirements of the contract documents.

D. Photometric Data: Supply complete photometric data for the fixture, including optical performance, rendered by an independent testing laboratory such as ETL, ITL, ERL etc., developed according to the methods of the Illuminating Engineering Society of North America. For exterior roadway, area, or floodlighting luminaries, photometric data shall include isocandela charts, coefficient of utilization, IES roadway distribution classification (where applicable), and isofootcandle plots for the specific mounting heights, lamps, and conditions of the project. Curves shall include vertical distribution in the plane of maximum candlepower and lateral distribution in the cone of maximum candlepower.

E. Substitutions shall include complete photometric data as outlined in paragraph 1.04D above, and point by point calculations for the specific conditions on the project. Samples shall be required for consideration of any substitutions and must be submitted in accordance with the terms outlined in paragraph 1.04F above.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

G. Maintenance Data: For each luminaire.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.

C. Electrical Components: Listed and classified by Underwriters Laboratories Inc. or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.6 WARRANTY

A. Standard Warranty – Note: Life of LED lighting (primarily the luminaire) is not yet well understood given the relative newness of the technology for this application. Projected life of LED luminaires is a key component to payback scenarios in buyers' purchase evaluations, therefore prospective buyers are looking for ways help assure products perform as anticipated. Since life claims provided by suppliers is typically 50,000 hours or greater and the first cost of LED parking lot luminaires can be significant, site County's are looking for assurances that the product will perform as claimed in terms of life.

B. Provide a written five year on-site replacement material, fixture finish, and workmanship warranty. On-site replacement includes transportation, removal, and installation of new products. Finish warranty must include warranty against failure or substantial deterioration such as blistering, cracking, peeling, chalking, or fading.

C. Provide a written five year replacement material warranty for defective or non-starting LED source assemblies.

D. Provide a written five-year replacement material warranty on all power supply units (PSUs).

E. Provide a written five year replacement warranty for luminaires producing inadequately-maintained illuminance levels at end of warranty period, as prorated from levels expected at end of useful life. For example, a luminaire expected to produce 70% of initial lumens at 100,000 hours would be expected to last over 11 years (continuous operation), so levels would be expected to be at 87% of initial at end of five-year warranty period. Warranty must cover all light sources (LED package, LED array, or LED module) including, but not limited to the LED die, encapsulate, and phosphor. If the expected useful life of the luminaire system as defined in Section 2.4 B is not maintained, then the manufacturer must replace the light source(s) or luminaire as needed.

F. County may request an optional 10 year replacement warranty for inadequately maintained illuminance levels, finish of luminaire, power supply unit (PSU), or defective LED source assemblies. The terms of the extended warranties will be negotiated by the County and the luminaire manufacturer for an additional cost.

G. Warranty period must begin on date of possession. The supplier will provide the County with appropriate signed warranty certificates. The County must receive certificates prior to final payment.

1.7 EXTRA MATERIALS

A. Furnish 10% of each type and wattage lamp installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved Manufacturers: Provide products of firms regularly engaged in the manufacture of lighting fixtures of types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years. The manufacturer of the lighting fixtures shall comply with the provisions of the appropriate code and standards. All fixtures shall be pretested before shipping.

B. Luminaires must be the type indicated on Drawings and as specified. Fixtures of the same type must be provided by one manufacturer.

C. Conformance: Fixtures shall be manufactured in strict accordance with the Contract Drawings and Specifications.

D. Codes: Materials and installation shall be in accordance with the latest revision of the National Electrical Code and any applicable Federal, State, and local codes and regulations.

E. UL Listing: All fixtures shall be manufactured in strict accordance with the appropriate and current requirements of the Underwriters' Laboratories, Inc. "Standards for Safety", and others as they may be applicable. A UL listing shall be provided for each fixture type, and the appropriate label or labels shall be affixed to each fixture in a position concealing it from normal view.

F. Specifications and scale drawings are intended to convey the salient features, function and character of the fixtures only, and do not undertake to illustrate or set forth every item or detail necessary for the work.

G. Base Bid Manufacturers: Are listed on lighting fixture schedule.

H. Alternate Manufacturers: Identification by means of manufacturer’s names and catalog numbers is to establish basic features, quality and performance standards. Any substitutions must meet or exceed these standards.

2.2 LIGHT SOURCE REQUIREMENTS

A. LED sources must meet the following requirements:
   1. Luminaires must be rated for -40°C to +50°C operation
   2. Correlated Color Temperature (CCT) shall be one of the following, as selected by County:
      a. Nominal CCT: 2700 K (2725 ± 145)

b. Nominal CCT: 3000 K (3045 ± 175)
c. Nominal CCT: 3500 K (3465 ± 245)
d. Nominal CCT: 4000 K (3985 ± 275)

3. Duv tolerance of 0.001 ± 0.006
4. Color Rendering Index (CRI): ≥ 80
5. Luminaire manufacturer must submit reliability reports indicating that the manufacturer of the LED (chip, diode, or package) has performed JEDEC (Joint Electron Devices Engineering Council) reliability tests on the LEDs as follows:
   a. High Temperature Operating Life (HTOL)
   b. Room Temperature Operating Life (RTOL)
   c. Low Temperature Operating Life (LTOL)
   d. Powered Temperature Cycle (PTMCL)
   e. Mechanical Shock
   f. Variable Vibration Frequency
   g. Solder Heat Resistance (SHR)

2.3 DRIVER REQUIREMENTS

A. Power Supply Units (PSUs) including drivers must meet the following requirements:
   1. Must have a minimum efficiency of 85%
   2. Must be rated to operate between -40°C to +50°C
   3. Input Voltage: capable of 120 to 480 (±10%) volt, single phase as required by the site
   4. Power supplies can be UL Class I or II output
   5. Operating frequency must be 50/60 Hz
   6. Drivers must have a Power Factor (PF) of: ≥ 0.90
   7. Drivers must have a Total Harmonic Distortion (THD) of: ≤ 20%
   8. Drivers must comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards
   9. Drivers must be Reduction of Hazardous Substances (RoHS) compliant. (see http://www.rohs.eu/english/index.html)

2.4 LUMINAIRES

A. General Requirements
   1. Luminaire must be UL-listed for wet locations and wiring cavity must be field accessible for service or repair needs.
   2. Optical cavity must be a minimum IEC 60529/IP65.
   3. Fully assemble and electrically test luminaires before shipment from factory.
   4. The coating must be capable of surviving ASTM B117 Salt Fog environment for 500 hrs minimum without blistering or peeling. The coating must demonstrate gloss retention of greater than or equal to 90% for 500 hrs exposure QUV test per ASTM G53 UVB313, 4 hr UV-B 60 ˚C/4 hr Condensation 50 ˚C.
   5. Luminaire arm bolts must be 304 stainless steel or zinc plated steel and Grade 8.
   6. Luminaires must have locality-appropriate governing mark and certification.

7. If a lens, not integral to the LED is used, construct the luminaire optical enclosure (lens/window) of clear and UV-resistant acrylic or glass.
8. 80% of the luminaire material by weight should be recyclable at end of life. Design luminaire for ease of component replacement and end-of-life disassembly.

B. Expected Useful Life (Light Output) and Depreciation
   1. Useful Life Requirement: The useful life of the luminaire in terms of lumen output must be as specified by one of the following two methods:
      a. Simplified L70 threshold: A minimum of 50,000 operating hours before reaching the L70 lumen output degradation point with no catastrophic failures. The L70 lumen output must be capable of providing the illuminance levels and uniformity specified in Section 1.6.
      b. Site performance method: A lifetime (in hours) specified by the County based on expected Site lighting use and planned replacement where the output at the specified useful life must be capable of providing the illuminance levels and uniformity specified in Section 1.6.
   2. Useful Life Testing and Verification Procedure:
      a. Simplified L70 threshold: Perform LM-79-08 testing on the luminaire at both time intervals of 0 hours and ≥ 6,000 hours. The luminaire must be operated continuously in the appropriate UL 1598/153 environment except when it is removed to perform the LM-79 light output tests. If the light output determined at ≥ 6,000 hours is ≥ 96% of the light output determined at 0 hours, the luminaire meets the simplified L70 threshold for useful life.
      b. To demonstrate compliance a test report shall be issued showing measurement results at T=0, measurement results at T≥ 6000 hours and a summary table showing percent lumen output change and percent input power change.
   3. Site defined performance method:
      a. Perform lumen maintenance testing per LM-80-08 on the light source(s) (module/array) for a minimum of 6000 hours (longer testing period is encouraged). Per LM-80-08, identify the case temperature measurement point (Ts) that is accessible to allow temporary attachment of a thermocouple for measurement of the LED temperature when installed in the luminaire. Access via a temporary hole in the housing, tightly resealed during testing with putty or other flexible sealant is allowable.
      b. Use the LM-80-08 test data to extrapolate the lumen depreciation of the LED module/array (lumen degradation at three temperatures) using a standard exponential decay curve fit as described in Appendix C.
      c. Identify the installed (in luminaire) operating temperature of the LED using the Ts point under operating conditions as described in LM-79-08. Use this in-luminaire LED module/array temperature to interpolate a decay curve between the three extrapolated degradation curves derived from LM-80 and exponential decay curve fitting.
      d. From this interpolated curve, determine the lamp lumen depreciation (LLD) value and useful life that meets the needs of the County defined hours of operation to end of useful life as well as the illuminance levels and

uniformity specified in Section 1.6. for the useful life of the luminaire. Document the use of LM-80 test data, the specific extrapolation procedure used, the interpolation between the three sets of LM-80 data, and all calculations applied in deriving the proposed LLD and useful life.

2.5 ELECTRICAL SYSTEM REQUIREMENTS

A. Surge Protection: The system must survive 250 repetitive strikes of "C Low" (C Low – 6kV/1.2 x 50 μs, 10kA/8 x 20 μs) waveforms at 1 minute intervals with less than 10% degradation in clamping voltage. "C Low" waveforms are as defined in IEEE/ASNI C62.41.2-2002, Scenario 1 Location Category C

B. Primary Fuse Protection: Provide double fusing with fuse holder appropriately sized to the current. Fuse voltage must be ≥ than the voltage indicated in section 2.3.A.3.

C. Under voltage protection via shutoff and short circuit protection via current limitation

D. Internal luminaire design must incorporate modular electrical connections

E. Exterior Luminaires: Shall be complete with all required accessories and attachments.

F. Luminaire Parts & Materials: All materials, accessories, and other related luminaire parts shall be new and free from defects which in any manner may impair their character, appearance, strength, durability and function, and fabrication to the time of delivery and until final acceptance of the work.

G. Luminaire Components: Shall be made of materials resistant to corrosion and thermal and mechanical stresses encountered in the normal application and functioning of the luminaires. Accessory equipment such as starters, sockets and lampholders shall be approved by U.L., CBM and ETL, unless otherwise noted.

H. Luminaires: Shall bear U.L. label and shall be wired and installed in full compliance with applicable codes. Luminaires installed in damp or wet locations shall carry the appropriate label.

I. Type Ommission: In the fixture schedule shall not relieve the Contractor of the responsibility of furnishing all required luminaires, of proper type, as shown on the Drawings.

J. Luminaire Mounting: Shall be surface mounted as specified in fixture schedule, and shall include sockets, diffusers, mounting hardware, shielding and all other necessary accessories.

K. Luminaire Housings: Shall be so constructed so that all electrical components are easily accessible and replaceable without removing luminaires from their mountings, or disassembly of adjacent construction. All exposed metal edges shall be finished smooth and blunt to prevent injury during handling or installation.

L. Access Hardware: Shall be captive type construction.

M. Lamp Sockets: Shall be suitable for the indicated lamps and shall be set so that lamps are positioned in optically correct relation to all luminaire components. If adjustable socket positions are provided, socket should be preset in factory for lamp specified. If different socket positions are specified for the same fixture, sockets shall be preset for each type, and cartons marked accordingly.

N. Hardware: For steel and aluminum fixtures, all screws, bolts, nuts and other fastening and latching hardware shall be zinc cadmium or equivalent plated. For stainless steel fixtures, all hardware shall be stainless steel. For bronze fixtures, all hardware shall be stainless steel or bronze. For brass or brass finished fixtures, all hardware shall be brass.

O. Temperature: All fixtures and ballasts must operate within the temperature limits of their design and as specified by Underwriters' Laboratories, Inc. in the applications and mounting conditions herein specified.

P. Luminaire Components: Shall be made of materials resistant to corrosion and thermal and mechanical stresses encountered in the normal application and functioning of the fixtures. Accessory equipment such as starters, sockets and lampholders shall be approved by U.L., CBM and ETL, unless otherwise noted.

Q. Labels: Inscriptions and labels in luminaires shall be located in unobtrusive places so that they are not visible to occupants in the completed installation.

R. Luminaire Finish: All exposed metallic and non-metallic parts of fixtures such as the fixture body, pendants, canopies, filters, trims, and louvers shall be finished as specified or detailed. When color or finish is not specified, it shall be as directed by the Architect. The finish of fixtures shall be uniform in quality and free from defects such as whirls, discoloration, sand or dust spots, cracks or chips.

S. Luminaires of the same family, i.e., all varieties of floodlights or sconces shall be the product of one manufacturer, except for specified unique luminaires available from only one manufacturer.

T. Security Luminaires: Shall be provided with tamper-proof spanner type screws, unless otherwise specified. Provide a minimum of two special screw drivers for use with the type of security screws provided.

2.6 BALLASTS

A. Fluorescent Ballasts: ANSI C82.1, high power factor type electromagnetic ballast, suitable for lamps specified.

B. Provide low-temperature ballast suitable for lamps specified.

C. Voltage: Match luminaire voltage on schedule.

D. Lamp and Ballast: Characteristics shall be matched.

E. Certify fluorescent ballast design and construction by Certified Ballast Manufacturers, Inc.

F. Electronic Compact Fluorescent Ballast: Shall have a minimum of .9 power factor. Ballast shall have "end of life" shut-down circuit.

G. Products: Osram Sylvania, Philips, GE Lighting and Universal

2.7 LAMPS

A. Manufacturers:
   1. Osram Sylvania: www.sylvania.com
   2. GE Lighting: www.gelighting.com.
   3. Philips Lighting Co of NA; Model NA: www.lighting.philips.com.

B. Lamp Types: As specified for each luminaire and on the schedule.

C. Contractor to furnish and install all lamps as specified for the individual luminaires or lighting equipment.

D. Lamps of the same type shall be the product of one manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 501.

B. Install lamps in each luminaire.

3.2 FIELD QUALITY CONTROL

A. Perform field inspection, testing, and adjusting.

B. Operate each luminaire after installation and connection. Inspect for improper connections and operation.

C. Measure illumination levels to verify conformance with performance requirements. Take measurements during night sky, without moon or with heavy overcast clouds effectively obscuring moon.

3.3 ADJUSTING

A. Aim and adjust luminaires to provide illumination levels and distribution as directed.

3.4 CLEANING

A. Clean electrical parts to remove conductive and deleterious materials.

B. Remove dirt and debris from enclosure.

C. Clean photometric control surfaces as recommended by manufacturer.

D. Clean finishes and touch up damage.

3.5 PROTECTION OF FINISHED WORK

A. Relamp luminaires which have failed lamps at Substantial Completion.

3.6 LIGHTING FIXTURE SCHEDULE- SEE CONTRACT DRAWINGS

END OF SECTION 26 56 00

SECTION 26 83 11

DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Heat detectors.
5. Notification appliances.
6. Device guards.
7. Firefighters' two-way telephone communication service.
8. Magnetic door holders.
9. Remote annunciator.
10. Addressable interface device.
11. Digital alarm communicator transmitter.
12. System printer.

1.3 DEFINITIONS

A. EMT: Electrical Metallic Tubing.

B. FACP: Fire Alarm Control Panel.

C. NICET: National Institute for Certification in Engineering Technologies.

D. PC: Personal computer.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including furnished options and accessories.
1. Include construction details, material descriptions, dimensions, profiles, and finishes.
2. Include rated capacities, operating characteristics, and electrical characteristics.

B. Shop Drawings: For fire-alarm system.
   1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
   2. Include plans, elevations, sections, details, and attachments to other work.
   3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
   4. Detail assembly and support requirements.
   5. Include voltage drop calculations for notification-appliance circuits.
   6. Include battery-size calculations.
   7. Include input/output matrix.
   8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
   9. Include performance parameters and installation details for each detector.
   10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
   11. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.
      a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
      b. Show field wiring required for HVAC unit shutdown on alarm.
      c. Show field wiring and equipment required for HVAC unit shutdown on alarm and override by firefighters' control system.
      d. Show field wiring and equipment required for HVAC unit shutdown on alarm and override by firefighters' smoke-evacuation system.
      e. Locate detectors according to manufacturer's written recommendations.
      f. Show air-sampling detector pipe routing.
   12. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

C. General Submittal Requirements:
   1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to County’s Representative.
   2. Shop Drawings shall be prepared by persons with the following qualifications:
      a. Trained and certified by manufacturer in fire-alarm system design.
      b. NICET-certified, fire-alarm technician; Level IV minimum.
      c. Licensed or certified by authorities having jurisdiction.

D. Delegated-Design Submittal: For fire alarm system, notification appliances, and smoke and heat detectors, in addition to submittals listed above, indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Drawings showing the location of each notification appliance and smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the device.
   2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72. Calculate spacing and intensities for strobe signals and sound-pressure levels for audible appliances.
   3. Indicate audible appliances required to produce square wave signal per NFPA 72.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
   1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following and deliver copies to authorities having jurisdiction:
      a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
      b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
      c. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points.
      d. Riser diagram.
      e. Device addresses.
      f. Air-sampling system sample port locations and modeling program report showing layout meets performance criteria.

g. Record copy of site-specific software.
h. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:
   1) Equipment tested.
   2) Frequency of testing of installed components.
   3) Frequency of inspection of installed components.
   4) Requirements and recommendations related to results of maintenance.
   5) Manufacturer's user training manuals.
i. Manufacturer's required maintenance related to system warranty requirements.
j. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

B. Software and Firmware Operational Documentation:
   1. Software operating and upgrade manuals.
   2. Program Software Backup: On magnetic media or compact disk, complete with data files.
   3. Device address list.
   4. Printout of software application and graphic screens.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
   2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
   3. Smoke Detectors, Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than one unit of each type.
   4. Detector Bases: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
   5. Keys and Tools: One extra set for access to locked or tamperproofed components.
   6. Audible and Visual Notification Appliances: One of each type installed.
   7. Fuses: Two of each type installed in the system. Provide in a box or cabinet with compartments marked with fuse types and sizes.
   8. Filters for Air-Sampling Detectors: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
   9. Air-Sampling Fan: Quantity equal to one for every five detectors, but no fewer than one unit of each type.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level IV technician.

C. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

1.9 PROJECT CONDITIONS

A. Perform a full test of the existing system prior to starting work. Document any equipment or components not functioning as designed.

B. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by County or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
   1. Notify Architect no fewer than seven days in advance of proposed interruption of fire-alarm service.
   2. Do not proceed with interruption of fire-alarm service without County's Representative's written permission.

C. Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

1.10 SEQUENCING AND SCHEDULING

A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service, and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.

B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.
   1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
   2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of, existing system. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.

B. Noncoded, UL-certified or FM Global-placarded addressable system, with multiplexed signal transmission and horn/strobe evacuation.

C. Automatic sensitivity control of certain smoke detectors.

D. All components provided shall be listed for use with the selected system.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:
1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Automatic sprinkler system water flow.
6. Fire-extinguishing system operation.
7. Fire standpipe system.
8. Dry system pressure flow switch.

B. Fire-alarm signal shall initiate the following actions:
1. Continuously operate alarm notification appliances.
2. Identify alarm and specific initiating device at fire-alarm control unit and remote annunciator.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Unlock electric door locks in designated egress paths.
5. Release fire and smoke doors held open by magnetic door holders.
6. Activate voice/alarm communication system.
7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
8. Activate smoke-control system (smoke management) at firefighters' smoke-control system panel.
9. Activate stairwell and elevator-shaft pressurization systems.
10. Close smoke dampers in air ducts of designated air-conditioning duct systems.

11. Recall elevators to primary or alternate recall floors.
12. Activate elevator power shunt trip.
13. Activate emergency lighting control.
14. Activate emergency shutoffs for gas and fuel supplies.
15. Record events in the system memory.
16. Record events by the system printer.
17. Indicate device in alarm on the annunciator.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:
1. Valve supervisory switch.
2. High- or low-air-pressure switch of a dry-pipe or preaction sprinkler system.
3. Elevator shunt-trip supervision.
4. User disabling of zones or individual devices.
5. Loss of communication with any panel on the network.

D. System trouble signal initiation shall be by one or more of the following devices and actions:
1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.
10. Hose cabinet door open.

E. System Supervisory Signal Actions:
1. Initiate notification appliances.
2. Identify specific device initiating the event at fire-alarm control unit, and remote annunciators.
3. Record the event on system printer.
4. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.
5. Transmit system status to building management system.
6. Display system status on annunciator.

2.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.4 FIRE-ALARM CONTROL UNIT

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Fire-Lite Alarms, Inc.; a Honeywell International company.
   2. Gamewell - FCI by Honeywell.
   3. Notifier.
   4. Siemens Industry, Inc.; Fire Safety Division.
   5. SimplexGrinnell LP.

B. General Requirements for Fire-Alarm Control Unit:
   1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.
      a. System software and programs shall be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining the information through failure of primary and secondary power supplies.
      b. Include a real-time clock for time annotation of events on the event recorder and printer.
      c. Provide communication between the FACP and remote circuit interface panels, annunciators, and displays.
      d. The FACP shall be listed for connection to a central-station signaling system service.
      e. Provide nonvolatile memory for system database, logic, and operating system and event history. The system shall require no manual input to initialize in the event of a complete power down condition. The FACP shall provide a minimum 500-event history log.
   2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.
   3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.

C. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.
   1. Annunciator and Display: Liquid-crystal type, 80 characters, minimum.
   2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

D. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.
   1. Annunciator and Display: Liquid-crystal type, two three line(s) of 80 characters, minimum.
   2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

E. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:
   1. Pathway Class Designations: NFPA 72, Class D.
   2. Pathway Survivability: Level 1.
   3. Install no more than 50 addressable devices on each signaling-line circuit.
   4. Serial Interfaces:
      a. One dedicated RS 485 port for remote station operation using point ID DACT.
      b. One RS 485 port for remote annunciators, Ethernet module, or multi-interface module (printer port).
      c. One USB RS 232 port for PC configuration.

F. Stairwell and Elevator Shaft Pressurization: Provide an output signal using an addressable relay to start the stairwell and elevator shaft pressurization system. Signal shall remain on until alarm conditions are cleared and fire-alarm system is reset. Signal shall not stop in response to alarm acknowledge or signal silence commands.
   1. Pressurization starts when any alarm is received at fire-alarm control unit.
   2. Alarm signals from smoke detectors at pressurization air supplies have a higher priority than other alarm signals that start the system.

G. Smoke-Alarm Verification:
   1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
   2. Activate an approved "alarm-verification" sequence at fire-alarm control unit and detector.
   3. Record events by the system printer.
   4. Sound general alarm if the alarm is verified.
   5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

H. Notification-Appliance Circuit:
   1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
   2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.

3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.

I. Elevator Recall:
   1. Elevator recall shall be initiated only by one of the following alarm-initiating devices:
      a. Elevator lobby detectors except the lobby detector on the designated floor.
      b. Smoke detector in elevator machine room.
      c. Smoke detectors in elevator hoistway.
   2. Elevator controller shall be programmed to move the cars to the alternate recall floor if lobby detectors located on the designated recall floors are activated.
   3. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.
      a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.

J. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke-barrier walls shall **be** connected to fire-alarm system.

K. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

L. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

M. Printout of Events: On receipt of signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble) and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including same information for device, location, date, and time. Commands initiate the printing of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.

N. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals supervisory and digital alarm communicator transmitters and digital alarm radio transmitters shall be powered by 24-V dc source.
   1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

O. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
   1. Batteries: Sealed lead calcium Sealed, valve-regulated, recombinant lead acid Vented, wet-cell pocket, plate nickel cadmium.

P. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.5 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
   1. Single-action mechanism, breaking-glass or plastic-rod pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
   2. Double-action mechanism requiring two actions to initiate an alarm, breaking-glass or plastic-rod pull-lever type; with integral attached addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
   3. Station Reset: Key- or wrench-operated switch.
   4. Indoor Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
   5. Weatherproof Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.6 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:
   1. Comply with UL 268; operating at 24-V dc, nominal.
   2. Detectors shall be four two-wire type.
   3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
   4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
   5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
   6. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.

7. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
    a. Rate-of-rise temperature characteristic of combination smoke- and heat-detection units shall be selectable at fire-alarm control unit for 15 or 20 deg F (8 or 11 deg C) per minute.
    b. Fixed-temperature sensing characteristic of combination smoke- and heat-detection units shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F (57 or 68 deg C).
    c. Multiple levels of detection sensitivity for each sensor.
    d. Sensitivity levels based on time of day.

B. Photoelectric Smoke Detectors:
1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

C. Ionization Smoke Detector:
1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

D. Duct Smoke Detectors: Photoelectric type complying with UL 268A.
1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.7 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.
   1. Temperature sensors shall test for and communicate the sensitivity range of the device.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or a rate of rise that exceeds 15 deg F (8 deg C) per minute unless otherwise indicated.
   1. Mounting: Adapter plate for outlet box mounting Twist-lock base interchangeable with smoke-detector bases.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F (88 deg C) .
   1. Mounting: Adapter plate for outlet box mounting Twist-lock base interchangeable with smoke-detector bases.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

D. Continuous Linear Heat-Detector System:
   1. Detector Cable: Rated detection temperature 155 deg F (68 deg C) . Listed for "regular" service and a standard environment. Cable includes two steel actuator wires twisted together with spring pressure, wrapped with protective tape, and finished with PVC outer sheath. Each actuator wire is insulated with heat-sensitive material that reacts with heat to allow the cable twist pressure to short circuit wires at the location of elevated temperature.
   2. Control Unit: Two-zone or multizone unit as indicated. Provide same system power supply, supervision, and alarm features as specified for fire-alarm control unit.
   3. Signals to Fire-Alarm Control Unit: Any type of local system trouble shall be reported to fire-alarm control unit as a composite "trouble" signal. Alarms on each detection zone shall be individually reported to central fire-alarm control unit as separately identified zones.
   4. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.8 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
   1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

B. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn, using the coded signal prescribed in UL 464 test protocol.

C. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.
   1. Rated Light Output:
      a. 15/30/75/110 cd, selectable in the field.
   2. Mounting: Wall mounted unless otherwise indicated.
   3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
   4. Flashing shall be in a temporal pattern, synchronized with other units.
   5. Strobe Leads: Factory connected to screw terminals.
   6. Mounting Faceplate: Factory finished, red white.

D. Exit Marking Audible Notification Appliance:
   1. Exit marking audible notification appliances shall meet the audibility requirements in NFPA 72.
   2. Provide exit marking audible notification appliances at the entrance to all building exits.
   3. Provide exit marking audible notification appliances at the entrance to areas of refuge with audible signals distinct from those used for building exit marking.

2.9 FIREFIGHTERS' TWO-WAY TELEPHONE COMMUNICATION SERVICE

A. Dedicated, two-way, supervised, telephone voice communication links between fire-alarm control unit, the fire command center**,** and remote firefighters' telephone stations. Supervised telephone lines shall be connected to talk circuits by controls in a control module. Provide the following:
   1. Selective-talk type for use by firefighters and fire wardens.
   2. Controls to disconnect phones from talk circuits if too many phones are in use simultaneously. An indicator lamp shall flash if a phone is disconnected from the talk circuits.

3. Addressable firefighters' phone modules to monitor and control a loop of firefighter phones. Module shall be capable of differentiating between normal, off-hook, and trouble conditions.
4. Audible Pulse and Tone Generator, and High-Intensity Lamp: When a remote telephone is taken off the hook, it causes an audible signal to sound and a high-intensity lamp to flash at the fire-alarm control unit.
5. Selector panel controls to provide for simultaneous operation of up to six telephones in selected zones. Indicate ground faults and open or shorted telephone lines on the panel front by individual LEDs.
6. Display: Digital to indicate location of caller.
7. Remote Telephone Cabinet: Flush- or surface-mounted cabinet as indicated, factory-standard red finish, with handset.
    a. Install one-piece handset to cabinet with vandal-resistant armored cord. Silk-screened or engraved label on cabinet door, designating "Fire Warden Phone" or "Fire Emergency Phone."
    b. With "break-glass" type door access lock.
8. Remote Telephone Jack Stations: Single-gang, stainless-steel-plate mounted plug, engraved "Fire Warden Phone" or "Fire Emergency Phone."
9. Handsets: push-to-talk-type sets with noise-canceling microphone stored in a cabinet adjacent to fire-alarm control unit in the fire command center.

2.10 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.
    1. Electromagnets: Require no more than 3 W to develop 25-lbf (111-N) holding force.
    2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
    3. Rating: 120-V ac.

B. Material and Finish: Match door hardware.

2.11 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.
    1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.12 ADDRESSABLE INTERFACE DEVICE

A. General:
   1. Include address-setting means on the module.
   2. Store an internal identifying code for control panel use to identify the module type.
   3. Listed for controlling HVAC fan motor controllers.

B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.

C. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall to circuit-breaker shunt trip for power shutdown.
   1. Allow the control panel to switch the relay contacts on command.
   2. Have a minimum of two normally open and two normally closed contacts available for field wiring.

D. Control Module:
   1. Operate notification devices.
   2. Operate solenoids for use in sprinkler service.

2.13 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:
   1. Verification that both telephone lines are available.
   2. Programming device.
   3. LED display.
   4. Manual test report function and manual transmission clear indication.
   5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:
   1. Address of the alarm-initiating device.
   2. Address of the supervisory signal.

3. Address of the trouble-initiating device.
4. Loss of ac supply.
5. Loss of power.
6. Low battery.
7. Abnormal test signal.
8. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.14 SYSTEM PRINTER

A. Printer shall be listed and labeled as an integral part of fire-alarm system.

2.15 DEVICE GUARDS

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.
   1. Factory fabricated and furnished by device manufacturer.
   2. Finish: Paint of color to match the protected device.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
   1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION

A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."
   1. Devices placed in service before all other trades have completed cleanup shall be replaced.

2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.

B. Install wall-mounted equipment, with tops of cabinets not more than 78 inches (1980 mm) above the finished floor.
   1. Comply with requirements for seismic-restraint devices specified in Section 26 05 48.16 "Seismic Controls for Electrical Systems."

C. Manual Fire-Alarm Boxes:
   1. Install manual fire-alarm box in the normal path of egress within 60 inches (1520 mm) of the exit doorway.
   2. Mount manual fire-alarm box on a background of a contrasting color.
   3. The operable part of manual fire-alarm box shall be between 42 inches (1060 mm) and 48 inches (1220 mm) above floor level. All devices shall be mounted at the same height unless otherwise indicated.

D. Smoke- or Heat-Detector Spacing:
   1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
   2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
   3. Smooth ceiling spacing shall not exceed 30 feet (9 m).
   4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Annex B in NFPA 72.
   5. HVAC: Locate detectors not closer than 36 inches (910 mm) from air-supply diffuser or return-air opening.
   6. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.

E. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.

F. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches (910 mm) long shall be supported at both ends.
   1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.

G. Air-Sampling Smoke Detectors: If using multiple pipe runs, the runs shall be pneumatically balanced.

H. Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location. Do not install smoke detectors in sprinklered elevator shafts.

I. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

J. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

K. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

L. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling. Install all devices at the same height unless otherwise indicated.

M. Device Location-Indicating Lights: Locate in public space near the device they monitor.

N. Antenna for Radio Alarm Transmitter: Mount to building structure where indicated. Use mounting arrangement and substrate connection that resists 100-mph (160-km/h) wind load with a gust factor of 1.3 without damage.

3.3 PATHWAYS

A. Pathways above recessed ceilings and in non-accessible locations may be routed exposed.
   1. Exposed pathways located less than 96 inches (2440 mm) above the floor shall be installed in EMT.

B. Pathways shall be installed in EMT.

C. Exposed EMT shall be painted red enamel.

3.4 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 087100 "Door Hardware." Connect hardware and devices to fire-alarm system.
   1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches (910 mm) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
   1. Alarm-initiating connection to smoke-control system (smoke management) at firefighters' smoke-control system panel.
   2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
   3. Smoke dampers in air ducts of designated HVAC duct systems.
   4. Magnetically held-open doors.
   5. Electronically locked doors and access gates.
   6. Alarm-initiating connection to elevator recall system and components.
   7. Alarm-initiating connection to activate emergency lighting control.
   8. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
   9. Supervisory connections at valve supervisory switches.
   10. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
   11. Supervisory connections at elevator shunt-trip breaker.
   12. Data communication circuits for connection to building management system.
   13. Data communication circuits for connection to mass notification system.
   14. Supervisory connections at fire-extinguisher locations.
   15. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
   16. Supervisory connections at fire-pump engine control panel.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.6 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.7 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by County’s Representative and authorities having jurisdiction.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

D. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. Visual Inspection: Conduct visual inspection prior to testing.
      a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
      b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
   2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
   3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
   4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
   5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
   6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

F. Fire-alarm system will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

I. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.8 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
   1. Include visual inspections according to the "Visual Inspection Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
   2. Perform tests in the "Test Methods" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
   3. Perform tests per the "Testing Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3.9 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

C. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within **two** years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
   1. Upgrade Notice: At least 30 days to allow County to schedule access to system and to upgrade computer equipment if necessary.

3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train train County's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 28 31 11

SECTION 27 00 00

BASIC COMMUNICATIONS REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes general administrative and procedural requirements for Division 27, and is intended to supplement, not supersede, the general requirements specified in Division 01.

B. The requirements described herein include the following:
1. References
2. Definitions
3. System Description and Project Conditions
4. Submittals
5. Quality Assurance
6. Delivery, Storage, and Handling
7. Scheduling
8. Warranty
9. Product Substitutions
10. Project Management and Coordination Services
11. Permits and Inspections
12. Field Quality Control
13. Project Closeout and Record Documents

C. Related Items
1. General and Supplementary Conditions: General provisions of the Prime Contract and Divisions 00 and 01 apply to Division 27.
2. Consult other Divisions and Sections, determine the extent and character of related work, and coordinate Work of Division 27 with that specified elsewhere to produce a complete and operable installation.
3. Section 27 05 26, “Communication Grounding and Bonding”
4. Section 27 05 28, “Communication Building Pathways”
5. Section 27 05 33, “Communication Building Pathways – Conduits and Boxes”
6. Section 27 05 36, “Communication Building Pathways – Cable Tray”
7. Section 27 08 11, “Communication Twisted Pair Testing”
8. Section 27 08 21, “Communication Optical Fiber Testing”
9. Section 27 11 00, “Communication Equipment Rooms”
10. Section 27 13 13, “Communication Backbone ISP Twisted Pair Cabling”
11. Section 27 13 23, “Communication Backbone ISP Fiber Optic Cabling”
12. Section 27 15 13, “Communication Horizontal Twisted Pair Cabling”
13. Section 27 41 13, “Architecturally Integrated Projection Screens and Lifts”
14. Section 27 41 16, “Integrated Audiovisual Systems”

1.02 REFERENCES

A. General
   1. Codes, standards, and industry manuals/guidelines listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Consider such codes and/or standards a part of this specification as though fully repeated herein.
   2. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
   3. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest edition of such publications adopted and published prior to submittal of the bid unless otherwise specifically stated.

B. Codes: Perform work and furnish materials and equipment under Division 27 in accordance with applicable requirements of the latest edition of governing codes, rules and regulations including but not limited to the following minimum standards, whether statutory or not:
   1. California Code of Regulations (CCR):
      a. Title 8, “Industrial Relations”
         1) Chapter 3.22, “California Occupational Safety and Health Regulations (CAL/OSHA)”
      b. Title 24, “California Building Standards Code”
         1) Part 1, “California Building Standards Administrative Code”
         2) Part 2, “California Building Code” (CBC)
         3) Part 3, “California Electrical Code” (CEC)
         4) Part 11, “California Green Building Standards Code” (CALGeen)”
   2. Code of Federal Regulations (CFR) Title 47 “Telecommunication”, Chapter I “Federal Communications Commission (FCC)”:
      a. Part 15, “Radio Frequency Devices and Radiation Limits”
      b. Part 27, “Miscellaneous Wireless Communications Services”
      c. Part 68, “Connection of Terminal Equipment to the Telephone Network”
      d. Part 90, “Private Land Mobile Radio Services”
   3. Other applicable national, state, and local binding building and fire codes

C. Standards: Perform work and furnish materials and equipment under Division 27 in accordance with the latest editions of the following standards as applicable:
   1. Building Industry Consulting Services International (BICSI):
      a. Telecommunications Distribution Methods Manual (TDMM)
      b. Customer-Owned Outside Plant Design Manual
      c. Wireless Design Reference Manual (WDRM)
      d. Network Design Reference Manual (NDRM)
   2. EIA testing standards

3. National Electrical Contractors Association (NECA):
   a. ANSI/NECA 1, "Standard Practices for Good Workmanship in Electrical Construction"
4. Telecommunications Industry Association (TIA):
   a. ANSI/TIA-568-C.0, "Generic Telecommunications Cabling for Customer Premises"
   b. ANSI/TIA-568-C.1, "Commercial Building Telecommunications Cabling Standards - Part 1 General Requirements"
   c. ANSI/TIA-568-C.2, "Balanced Twisted Pair Telecommunications Cabling and Components"
   d. ANSI/TIA-568-C.3, "Optical Fiber Cabling Components"
   e. ANSI/TIA-569-B, "Commercial Building Standard for Telecommunications Pathways and Spaces"
   f. ANSI/TIA/EIA-598-B, "Optical Fiber Cable Color Coding"
   g. ANSI/TIA-606-B, "Administration Standard for Telecommunications Infrastructure"
   h. ANSI-TIA-607-B, "Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises"
   i. ANSI/TIA-758-A, "Customer-Owned Outside Plant Telecommunications Infrastructure Standard"
   j. ANSI/TIA-1005, "Telecommunications Infrastructure Standard for Industrial Premises"

1.03 DEFINITIONS

A. The definitions of Divisions 00 and 01 shall apply to Division 27 sections.

B. In addition to those definitions of Divisions 00 and 01, the following list of terms as used in this specification defined as follows:
   1. "AFF": Above Finished Floor
   2. "As directed": As directed or instructed by the Owner, or their authorized representative
   3. "AHJ": Authority Having Jurisdiction
   4. "Cabling": installed media ready for electronic or optical signal circuit use; a complete media connection comprised of cables, termination apparatus (patch panels, blocks, connectors), outlets, connecting media (path cord, crossconnects), labeling
   5. "CBC": California Building Code (CCR Title 24 Part 2)
   6. "CCR": California Code of Regulations
   7. "CEC": California Electrical Code (CCR Title 24 Part 3)
   8. "Connect": To install patch cords, equipment cords, crossconnect wire, etc. to complete an electronic or optical signal circuit
   9. "Cord": a length of cordage having connectors at each end. The term "Cord" is synonymous with the term "Jumper" and "Lead"
   10. "Engineer": TEECOM

11. "Furnish": To purchase, procure, acquire, and deliver complete with related accessories
12. "Identifier": A unique code assigned to an element of the Telecommunications infrastructure that links it to its corresponding record
13. "Install": To set in place, join, unite, fasten, link, attach, set up or otherwise connect together and test before turning over to the Owner, parts, items, or equipment supplied by contractor or others. Make installation complete and ready for regular operation
14. "IOR": Inspector Of Record
15. "ISP": Inside Plant
16. "LED": Light Emitting Diode
17. "MSDS": Material Safety Data Sheets
18. "NEC": National Electrical Code (NFPA 70)
19. "NEMA": National Electrical Manufacturers Association
20. "NFPA": National Fire Protection Agency
21. "NIC": Not In Contract (work or equipment)
22. "OFCI": Owner-furnished contractor-installed; coordinate the integration of components furnished by the Owner; provide mounting hardware, cable, connectors, etc. to ensure proper integration of OFCI equipment
23. "OFE": Owner Furnished Equipment
24. "OSP": Outside Plant
25. "Owner": Alameda County ITD
26. "PDF": portable document format (electronic file format / *.pdf)
27. "Pigtail": a length of cordage having connectors at one end
28. "Provide": To furnish, transport, install, erect, connect, test and turn over to the Owner, complete and ready for regular operation
29. "UL": Underwriters Laboratories

1.04 SYSTEM DESCRIPTION AND PROJECT CONDITIONS

A. In circumstances where the Specifications and Drawings conflict, the Drawings shall govern quantity and the Specifications shall govern quality.

1.05 SUBMITTALS

A. Submit required submittals to the General Contractor in the quantities and formats as required under the general contract. In the absence of requirements, provide as described in the following with reference to quantity and format.

B. Failure to comply with requirements in part or whole shall constitute grounds for rejection.

C. Resubmittals: For resubmittals, provide a cover letter with the resubmittal that lists the action taken and revisions made to each product in response to the Engineer's submittal review comments. Lack of this actions-taken cover letter shall constitute grounds for non-review and/or rejection of resubmittal packages.

D. Submittal Description: Product Data
   1. Obtain written approval from the Engineer for the product data submittal prior to materials and equipment purchase order and prior to installation.
   2. Quantity and Media: Submit product data as described in Division 01. In the absence of requirements given, submit product data submittal as directed in writing either as an electronic submittal (preferred) via approved means (e.g., email, e-transmit) or as four printed submittals (not preferred).
   3. Format and Organization – Electronic Submittal:
      a. File format shall be PDF, either as a single compiled PDF file or as a PDF portfolio. PDF files should be produced from original electronic media, not scans of printed media. If scans from prints are the only option, annotate electronically, not on the prints prior to scanning.
      b. Pages should be letter size (8.5" x 11")
      c. Organize the Content in the following order:
         1) Cover
         2) Table of Contents (TOC)
         3) Statement of compliance
         4) Product information
         5) Seismic calculations (as required)
      d. Clearly and precisely indicate the submitted product and accessories by part number using an electronic annotation (arrow, rectangle, oval, etc.). Where the product data presents "part number builds", list the exact part number of the submitted products and accessories.
      e. Add page numbers in numerical order with no gaps to each page that correctly correspond to the TOC.
   4. Format and Organization – Printed Submittal:
      a. Paper shall be letter size (8.5" x 11").
      b. Package printed submittal using a 3-ring binder, clear-front report cover, or similar.
         1) For 3-ring binders, clearly label the cover and spine of each binder with the required "Cover" information (e.g., insert the cover in the front and spine transparent pockets):
      c. Organize the content in the following order:
         1) Cover
         2) Table of Contents (TOC)
         3) Statement of compliance
         4) Product information
         5) Seismic calculations (as required)
      d. Include tabbed separators for improved navigation through the submittal.
      e. Clearly, precisely, and permanently indicate the submitted product and accessories by part number using an arrow stamp or other permanent indicator. Where the product data presents "part number builds", indicate the exact part number of the submitted products and accessories.
   5. Content:
      a. Cover: Include a cover that clearly displays the following information:
         1) Owner name

2) Project name and address
3) Submittal name (e.g., "Product Data Submittal for Telecommunications Equipment Rooms")
4) Project submittal number
5) Contractor's submittal number (discretionary)
6) Submittal date; format: Month Day, Year (e.g., "January 1, 2013")
7) Specification section numbers included in the submittal (e.g., "Section 271100")
8) Contractor name and contact information

b. Table of Contents (TOC): Include a TOC that lists materials by section number, article and paragraph number. Add a brief product description (what it is, size or color or other optional features), manufacturer and part number. List the submittal page number per product. Example heading for TOC:

Section	Article	Paragraph	Description	Manufacturer	Part #	Page #

c. Statement of Compliance: Include a "Statement of Compliance" letter or memorandum on the submitter's company letterhead from the highest ranking employee assigned to this project stating the submittal has been reviewed (quality control check) and is in full compliance with the requirements of the contract documents, and listing the submittal's contents. Wet sign (and stamped, if applicable) the letter.

d. Product Information: Include manufacturer's technical data, product literature, "catalog cuts", data sheets, specifications, and block wiring diagrams (if necessary) that clearly describe the product's characteristics, physical and dimensional information, electrical performance data, materials used in fabrication, material color and finish, and other relevant information such as test data, typical usage examples, independent test agency information, and storage requirements. Include products listed in the specifications, at a minimum. Include relevant products that will be installed, which are not listed in the specifications.

e. Seismic Calculations: Include structural calculations for anchorage and seismic restraint of floor-mounted equipment (such as racks, frames, cabinets), wall-mounted equipment (such as video display equipment, etc.), and overhead-mounted equipment (such as cable tray, overhead cable support, etc.) in conformance with CBC, Section 1601A. Calculations shall be based on fully loaded equipment and support systems. Calculations shall demonstrate that the equipment and support systems will remain attached to the mounting surface during and after experiencing seismic forces in conformance with the CBC. A Structural Engineer registered in the State of California shall prepare Structural Calculations, and shall wet stamp and sign them. Obtain approval from the Division of State Architect for the calculations.

E. Submittal Description: Shop Drawings
   1. Prior to the start of work, submit shop drawings and obtain written approval from the Engineer for the shop drawings submittal.
   2. Quantity and Media: Submit shop drawings as described in Division 01. In the absence of requirements given, submit shop drawings as directed in writing either an electronic submittal (preferred) via approved means (email, e-transmit, FTP upload) or four printed and bound sets on bond.
   3. Format:
      a. Use the same sheet size as the contract drawings.
      b. Use the same title block as the contract drawings, modified to include contractor information.
      c. Text: 3/32” - 1/8” high when plotted at full size.
      d. Use identical symbols as those in the contract drawings.
      e. Screen background information.
      f. Plot system components (symbols, outlet, devices, pathways, cable routes, etc.) and text using a heavier line weight sufficient enough to stand out against background information.
      g. Scaling:
         1) Scale floor plans and reflected ceiling plans at 1/8”=1’-0”
         2) Scale enlarged room plans at 1/4”=1’-0”
         3) Scale wall elevations at 1”=1’-0”
         4) Scale rack elevations at 1”=1’-0”
   4. Content:
      a. Cover Letter: Accompany each shop drawing submittal with a cover letter stating that the shop drawings have been thoroughly reviewed by the Contractor and are in full compliance with the requirements of the contract documents. Have the person who prepared the submittal sign (and stamped, if applicable) the cover letter and include a drawing index. Failure to comply with this requirement shall constitute grounds for rejection of submittal.
      b. Drawings: Shop drawing submittals shall consist of symbols list, point-to-point diagrams, block diagrams, riser diagrams, line diagrams, floor plans, reflected ceiling plans, enlarged room plans, wall and rack elevations, installation details, and other aspects of the system. Include detailed labeling examples for cables, outlets, termination apparatus, devices, equipment, etc.
      c. Seismic Calculations: Include structural calculations for anchorage and seismic restraint of floor-mounted equipment (such as racks, frames, cabinets), wall-mounted equipment (such as video display equipment, etc.), and overhead-mounted equipment (such as cable tray, overhead cable support, etc.) in conformance with CBC, Section 1601A. Calculations shall be based on fully loaded equipment and support systems. Calculations shall demonstrate that the equipment and support systems will remain attached to the mounting surface during and after experiencing seismic forces in conformance with the CBC. A Structural Engineer registered in the State of California shall prepare Structural Calculations, and shall wet stamp and sign them. Obtain approval from the Division of State Architect for the calculations.

F. Submittal Description: As-Built Drawings
   1. Quantity and Media: Submit as-built drawings as described in Division 01. In the absence of requirements given, submit as-built drawings as directed in writing as electronic files via approved media (or four printed and bound sets on bond, if approved).
   2. Format:
      a. Use the same sheet size as the contract drawings.
      b. Use the same title block as the contract drawings, modified to include contractor information.
      c. Text: 3/32” - 1/8” high when plotted at full size.
      d. Use symbols identical to the symbols shown on the contract drawings.
      e. Screen background information.
      f. Plot system components (symbols, outlet, devices, pathways, cable routes, etc.) and text using a heavier line weight sufficient enough to stand out against background information.
      g. Electronic files shall be native format and plotted PDF files. The file names shall include the sheet number.
   3. Content:
      a. Submit as-built drawings that fully represent actual installed conditions and that incorporate modifications made during the course of construction.
      b. Symbols List
      c. Diagrams, such as (but not limited to) point-to-point diagrams, block diagrams, riser diagrams, line diagrams, and other diagrams that conceptually describe the system
      d. Floor Plans and Reflected Ceiling Plans: Scale plans at 1/8”=1’-0”. Plans shall show:
         1) Locations and identifiers of telecommunications outlets
         2) Routes, types, sizes, and quantities of pathways (such as cable trays, conduits, hangers, and other pathways)
      e. Enlarged Rooms Layouts: Applicable rooms: Server Room, Entrance facilities, MTR, TRs, MDF, BDFs, IDFs. Room drawings shall show:
         1) Floor layouts – scaled at either 1/4”=1’-0” or 1/2”=1’-0”, showing dimensioned placement of equipment cabinets/frames, rack bays, etc.
         2) Overhead layouts – scaled at either 1/4”=1’-0” or 1/2”=1’-0”, showing dimensioned placement of overhead cable support (e.g., cable tray, cable runway, conduit sleeves, etc.)
         3) Rack elevations – scaled at 1”=1’-0”, showing placement of termination apparatus and other equipment installed onto rack bays
         4) Wall Elevations – scaled at 1”=1’-0”, showing dimensioned placement of termination apparatus (e.g., termination/crossconnect blocks)

G. Submittal Description: Operation and Maintenance (O&M) Manual
   1. Quantity and Media: Submit O&M Manual as described in Division 01. In the absence of requirements given, submit one packaged O&M Manual set.

2. Format and Organization:
   a. Include contents in a 3-ring binder with front cover and spine clear pockets for insertion of the cover information.
   b. Cover shall include the following information:
      1) Owner name
      2) Project name and address
      3) Manual name (e.g., "Operation and Maintenance Manual for Telecommunications Cabling System")
      4) Date; format: Month Day, Year (e.g., "January 1, 2014")
      5) Contractor name and contact information
   c. Include a ToC at the beginning that lists the contents.
   d. Include tabbed separators for improved navigation through the manual.
3. Content:
   a. Instructions on making a warranty claim during the warranty period
   b. Contact information during the warranty period
   c. Contact information beyond the warranty period for maintenance and related service
   d. As-built drawings, as described above, printed on tabloid size (17"x11") paper and as electronic files – both native files and plotted PDF files
   e. Product catalog/technical information sheets for each component provided under applicable section (typically, this is the {or similar to} the accepted product data submittal), printed on letter size (8.5" x 11") paper and as electronic files in PDF format
   f. Warranty certificate from the manufacturer and the contractor, printed on letter size (8.5" x 11") paper, wet signed as applicable
   g. Manufacturer's instructions for system or component use
   h. Instructions and requirements for proper maintenance (according to the manufacturer) and as to maintain warranty

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications
   1. Five continuous years, minimum, design and manufacture of the materials and equipment specified herein.
   2. Manufacturer(s) of products and equipment specified herein shall demonstrate that they have a quality assurance program in place to assure that the specifications are met. Include in the program, at a minimum, provisions for:
      a. Incoming inspection of raw materials
      b. In-process inspection and final inspection of the cable product
      c. Calibration procedures of test equipment to be used in the qualifications of the product
      d. Recall procedures in the event that out of calibration equipment is identified.
   3. Conform to government standards on quality assurance for applications within these specifications.

B. Contractor Qualifications:
   1. A current, active, and valid and C7 or C10 California State Contractors License
   2. Five, minimum, continuous years of experience
   3. Five, minimum, completed projects similar to scope and cost
   4. Evidence of technicians qualified for the work

C. Materials
   1. Materials, support hardware, equipment, parts comprising units, etc., shall be new, unused, without defects and of current manufacturer, materials
   2. Use specified products and applications, unless otherwise submitted and approved in writing.

D. Regulatory Requirements
   1. Work and materials shall conform to the latest rules of National Board of Fire Underwriters wherever such standards have been established and shall conform to the regulations of the State Fire Marshal, OSHA and the codes of the governing local municipalities. Work under Division 27 shall confirm to the most stringent of the applicable codes.
   2. Provide the quality identified within these specifications and drawings when codes, standards, regulations, etc. allow Work of lesser quality or extent. The contract documents address the minimum requirements for construction.

E. Drawings
   1. Follow the general layout shown on the drawings except where other work may conflict with the drawings.
   2. Drawings for the work within this division are essentially diagrammatic within the constraints of the symbology applied.
   3. The drawings do not fully represent the entire installation. Drawings indicate the general route for pathways and cables, and show general locations of outlets. The drawings might not expressly show every conduit, sleeve, hanger, etc., but a complete system is required.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery
   1. Do not deliver products to the site until protected storage space is available.
   2. Coordinate materials delivery with installation schedule to minimize storage time at jobsite.
   3. Deliver materials in manufacturer's original, unopened, undamaged packaging and containers with identification labels (name of the manufacturer, product name and number, type, grade, UL classification, etc.) intact.
   4. Immediately replace equipment damaged during shipping at no cost to the Owner, so as not to impact the construction schedule.

B. Storage and Protection
   1. Store materials in clean, dry, ventilated space free from temperature and humidity conditions (as recommended by manufacturer) and protected from exposure to harmful weather conditions.
   2. Comply with manufacturer's storage requirements for each product. Comply with recommended procedures, precautions or remedies as described in the MSDS as applicable.
   3. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris, and traffic.
   4. Storage outdoors covered by rainproof material is not acceptable.
   5. Provide heat where required to prevent condensation or temperature related damage.

C. Handling
   1. Handle materials and equipment in accordance with manufacturer's written instructions. Handle with care to prevent damage, breakage, denting, and scoring.
   2. Do not install damaged materials and equipment. Replace damaged equipment at no cost to the Owner.

1.08 SCHEDULING

A. Unless otherwise specified, the construction schedules of the Sections within Division 27 may be combined into a single, overall schedule.

B. Do not proceed without written approval from the Owner or Owner’s Representative for schedule of this Work.

1.09 PROJECT MANAGEMENT AND COORDINATION

A. Project Management and Coordination Services
   1. Provide a project manager for the duration of the project to coordinate this Work with other trades. Coordination services, procedures and documentation responsibility include, but are not limited to, the items listed in this section.
   2. Review of Shop Drawings Prepared by Other Subcontractors:
      a. Obtain copies of shop drawings for equipment provided by others that require telecommunication service connections or interface with work.
      b. Thoroughly review other trades’ shop drawings to confirm compliance with the service requirements contained in the Division 27 contract documents. Document discrepancies or deviations as follows:
         1) Prepare memo summarizing the discrepancy
         2) Submit a copy of the specific shop drawing, indicating via cloud, the discrepancy
      c. Prepare and maintain a shop drawing review log indicating the following information:
         1) Shop drawing number and brief description of the system/material
         2) Date of the review

3) Name of the individual performing the review
4) Indication if follow-up coordination is required

3. Should existing conditions prohibit construction progress as submitted and approved, coordinate the adjusted installed locations with the other contractors (AV, electrical, etc).

B. Concurrent Installation
1. The network will be installed concurrent with the work of Division 27. Coordinate your work with the Owner's/network integrator's work. For example, coordinate scope and dates for rack and cabling (terminations) readiness to allow the network integrator to plan and schedule installation of the network equipment (for example, access switches).

C. Role of the Engineer
1. The Owner has retained the Engineer's services through construction. During construction, the Engineer will work with and assist the Contractor as follows (in general):
   a. Review product data and shop drawings submittals for general compliance with the contract drawings and specifications.
   b. Provide interpretation and clarification of project contract documents
   c. Reply to (and 'process') relevant Requests for Information (RFIs)
   d. Review changes as they arise, and confirm that the proposed solutions maintain the intended functionality of the system.
   e. Interpret field problems for Owner, and translate between Owner and Construction Team.
   f. Review the testing procedures to confirm compliance with industry-accepted practices.
   g. Observe the work for general compliance with the contract documents and to ensure that the installation meets the design intent of the system, and report progress to the Owner.

D. Use of Electronic Drawing Files
1. Should the Contractor require the Engineer's electronic files to produce shop drawings and/or as-built drawings, the Engineer will require the Contractor sign a file release agreement.

1.10 WARRANTY

A. As a minimum, warrant products and labor provided will, under normal use and service, be free from defects and faulty workmanship for period of 1 year from the date of acceptance. During the warranty period the entire system shall be kept in operating condition at no additional material or labor costs to the Owner. Also refer to specific sections for additional warranty requirements that supersedes the project's minimum warranty.

B. Render service within 24 hours of system failure notification. Note deviations or improvements to this service at the time of bid and obtain written acceptance from the County, or County's Representative.

C. Manufacturers of the major system components shall maintain a replacement parts department and provide testing equipment when needed. Provide complete replacement parts within 24 hours during the warranty period.

D. Conformance to certain government standards on quality assurance may be required for some applications outlined in these specifications.

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials used shall present no environmental or toxicological hazards as defined by current industry standards and shall comply with OSHA and EPA standards, other applicable federal, state, and local laws.

B. Product numbers are subject to change by the manufacturer without notification. In the event a product number is invalid or conflicts with the written description, notify the General Contractor in writing prior to ordering the material and performing installation work.

2.02 PRODUCT SUBMITTAL AT TIME OF BID

A. At the time of bid, include a list of major products in the Contract documenting the intended cabling system solution, AV equipment, etc.

2.03 SUBSTITUTIONS

A. Conform to the substitutions requirements and procedures outlined in Division 01.

B. Only one substitution for each product specified will be considered.

C. Where products are noted as "or equal", a product of equivalent design, manufacture, and performance will be considered. Submit product data (product information, catalog cuts, pertinent test data, etc.) to substantiate that the product is in fact equivalent to that specified. The burden of proof that the substituted product is equivalent to the specified product rests with the Contractor. Whenever material, process or equipment is specified in accordance with an industry specification (ANSI, TIA, etc), UL rating, or other association standard, present an affidavit from the manufacturer certifying that the product complies with the particular standard specification. When requested by the Engineer, submit supporting test data to substantiate compliance.

D. Manufacturers' names and model numbers used in conjunction with materials, processes or equipment included in the contract documents are used to establish standards of quality, utility and appearance. Materials, processes or equipment that, in the opinion of the Engineer, are equivalent in quality, utility and appearance will be approved as substitutions to that specified when “or equal” follows the manufacturers' names or model number(s).

E. When the Engineer accepts a substitution in writing, it is with the understanding that the Contractor guarantees the substituted product, component, article, or material to be equivalent to the one specified and dimensioned to fit within the construction according to contract documents. Do not provide substituted material, processes, or equipment without written authorization from the Engineer. Assumptions on the acceptability of a proposed substitution, prior to acceptance by the Engineer, are at the sole risk of the Contractor.

F. Approved substitutions shall not relieve the Contractor of responsibilities for the proper execution of the work, or from provisions of the specifications.

G. Pay expenses, without additional charge to the Owner, in connection with substitution materials, processes and equipment, including the effect of substitution on self, subcontractor's or other Contractor's work.

PART 3 - EXECUTION

3.01 PERMITS AND INSPECTIONS

A. Obtain and pay for permits and inspections required for the work.

B. Furnish materials and execute workmanship for this work in conformance with applicable legal and code requirements.

C. Perform tests required herein, or as may be reasonably required to demonstrate conformance with the Specifications or with the requirements of legal authority having jurisdiction.

D. Arrange and pay for review/inspection from compliance officials responsible for enforcement of applicable codes and regulations to establish that the work is in compliance with requirements of reference codes indicated herein.

3.02 EXAMINATION

A. Verify existing conditions, stated under other sections, are acceptable for installation in accordance with manufacturer's instructions.

3.03 FIELD QUALITY CONTROL

A. Staffing: Provide a qualified foreman to supervise the crew performing the work and who is present at the job site at times work is being performed.

B. Construction Meetings: Participate in construction coordination meetings throughout the course of construction to review the progress and to resolve issues and conflicts. Prepare and distribute meeting agenda for telecommunication issues prior to, and meeting notes after meetings, in a format acceptable to the Owner. Publish meeting notes within 3 business days following the meeting.

C. Scheduling: Perform the work within the approved construction schedule. Keep the construction schedule current, based on the results of the construction meetings. At minimum, schedule shall document critical due dates, tasks, and milestones. Submit revised schedules for approval within 3 business days whenever there are modifications.

D. Inspection: Inspect the work after installation. Keep areas of work accessible and notify code authorities, or designated inspectors, of work completion ready for inspection. Document completion and inspection as required.

3.04 INSTALLATION

A. Complete work in a neat, high-quality manner, relative to common industry practices, and in accordance to NECA “Standard of Installation”.

B. Complete work in conformance to applicable federal, state and local codes, and telephone standards.

C. Coordinate the entire installation throughout the construction team (general contractor and subcontractors).

D. Manufacturer's Instructions: Comply with manufacturer's published installation instructions, product data, product technical bulletins, product catalog, and other instructions for installation. Maintain a file on the jobsite of MSDSs for each product delivered to jobsite packaged with an MSDS.

E. Adjusting: Make changes and revisions to systems to optimize operation for final use. Make changes to systems such that defects in workmanship are corrected and completed systems pass the minimum test requirements.

F. Protection: Protect installed products and finish surfaces from damage during construction.

G. Repair/Restoration: Replace or repair work completed by others that you deface or destroy. Pay the full cost of this repair/replacement. Repair defects prior to system acceptance.

3.05 CLEANING

A. Remove temporary coverings and protection of adjacent work areas. Remove unused, excess, and left over products, debris, spills, or other excess materials. Remove installation equipment.

B. Leave finished work and adjacent surfaces in neat, clean condition with no evidence of damage.

C. Repair or replace damaged installed products.

D. Legally dispose of debris.

E. Clean installed products in accordance with manufacturer's instructions prior to Owner's, or Owner's Representative's, punch walk.

3.06 PUNCH WALKS AND PUNCH LISTS

A. Punching the Work of individual Sections of Division 27 may be combined when noted so.

B. Execute a punch walk with the Engineer and the Owner or Owner's Representative to observe Work.

C. Develop a punch list for items needing correction. Issue this punch list to Engineer.

D. Correct the Work as noted on punch list.

E. Execute follow up punch walk with the Engineer and the Owner or Owner's Representative to verify punch list items have been corrected.

3.07 SYSTEM ACCEPTANCE

A. Complete corrections (punch list items) prior to submitting acceptance certificate.

B. On completion of the acceptance test, submit system acceptance certificate to the Owner or Owner's Representative requesting their signature and return of the certificate. Issue copies of the signed certificate back to the Owner or Owner's Representative with copy to the Engineer.

3.08 TRAINING

A. After acceptance, schedule a time convenient with the Owner, or Owner's Representative, for instruction in the configuration, operation, and maintenance of the system.

B. Refer to individual sections within Division 27 for additional training requirements.

END OF SECTION 27 00 00

SECTION 27 05 26

COMMUNICATIONS GROUNDING AND BONDING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Communications Grounding Backbone and bonding of communications infrastructure and equipment to Communications Grounding Backbone.

B. Related Sections
   1. Comply with the Related Sections requirements of Section 27 00 00.

1.02 REFERENCES

A. Comply with the References requirements of Section 27 00 00.

B. In particular or addition to the codes and standards listed in Section 27 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
   1. NFPA 70, "National Electrical Code", particularly the following Articles:
      a. Article 250: Grounding
      b. Article 770: Optical Fiber Cables and Raceways
      c. Article 800: Communications Systems
   2. Underwriters Laboratories, Inc. (UL) UL 467: Grounding and Bonding Equipment
   3. Electronic Industries Association/Telecommunication Industry Association:
      a. ANSI-TIA-607-B, "Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises"
   4. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
      a. IEEE 467, "IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems"
      b. IEEE P1100, "IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment in Industrial and Commercial Power Systems"

1.03 DEFINITIONS

A. Definitions as described in Section 27 00 00 shall apply to this section.

B. In addition to those Definitions of Section 27 00 00, the following list of terms as used in this specification defined as follows:
   1. "BCT": Bonding Conductor for Telecommunications
   2. "CM" and "cmil": Circular Millionths of an inch
   3. "GE": Grounding Equalizer Conductor

4. “MBRGB”: Main Building Reference Grounding Busbar
5. “TBB”: Telecommunications Bonding Backbone
6. “TBC”: Telecommunications Bonding Conductor
7. “TGB”: Telecommunication Grounding Busbar
8. "THHN”: Thermoplastic High Heat-resistant Nylon-coated
9. “TMGB”: Telecommunication Main Grounding Busbar

1.04 SYSTEM DESCRIPTION

A. Base Bid Work: The Work under this section includes furnishing materials, installation, and coordination through the General Contractor with other trades for a Communications Grounding Backbone and for bonding of telecommunications equipment and apparatus to the Communications Grounding Backbone.

B. Communications Grounding Backbone System: The Communications Grounding Backbone System contains grounding busbars, grounding conductors, bonding conductors, and connecting devices (including but not limited to pressure connectors, lugs, clamps, or exothermic welds). These components, upon completion of installation and testing, shall provide the means of a low impedance path to earth for unintentional and/or stray voltages or spurious signals present on telecommunications media and equipment. The Communications Grounding Backbone System will consist of the following aspects (refer to Drawings for additional information)
   1. TMGB: Locate the TMGB in the MDF with the following connections:
      a. MBRGB, via BCT (refer to Drawings for wire size)
      b. Each TBB
      c. Ground bushings installed on each entrance conduit opening within the space, via TBC
      d. Overhead cable support within the space, via TBC
      e. Dedicated power panel’s ACEG within the space serving communication equipment, via TBC
      f. Metallic pathways (conduits, surface raceway, etc.) within the space, via TBC
   2. TBB: TBB(s) are the primary bonding conductor between the TMGB and other TGBs provided throughout a single building. The length of TBBs shall not exceed 500 feet. The TBB shall route from the MDF through each of the IDFs bonding each of the TGBs to the TMGB. Maintain TBB continuity and do not break continuity in order to bond to a TGB.
   3. TGB: Locate the TGB in each IDF with the following connections:
      a. TBB
      b. Building steel, via TBC
      c. Each entrance conduit into the space, via TBC and ground bushings
      d. Overhead cable support within the space,, via TBC
      e. Panelboard’s ACEG within the space serving telecommunication equipment, via TBC
      f. Metallic pathways (conduits, surface raceway, etc.) within the space, via TBC

C. Performance Criteria for the Grounding Backbone:
   1. Resistance from any point of the communication grounding backbone system to the ground electrode and to earth shall not exceed 20 Ohms.
   2. Field test resistance and document, both electronically and printed, measured values.

D. Bonding: Bonding consists of TBCs within telecommunications rooms from the TMGB and TGBs to the following components:
   1. Rack bay
   2. Overhead cable support and vertical cable support
   3. Wall-mounted termination equipment
   4. Conduit ground bushings
   5. Exit pathways
   6. Bonding jumpers between basketway, cable runway, and cable tray joints & splices, and between basketway/cable runway/tray and equipment racks

E. Conductor Gauge Criteria:
   1. Refer to drawings.

1.05 SUBMITTALS

A. Comply with Submittal procedural, quantity, and format requirements of Section 27 00 00.

B. Submittal Requirements at Start Of Construction:
   1. Product Data Submittal
   2. Shop Drawing Submittal(s), if the Contractor's installation intent differs from the Contract Documents or the deign intent

C. Substitutions
   1. Requests for substitutions shall conform to the general requirements and procedure outlined in Section 27 00 00.

D. Submittal Requirements at Closeout: Submit to the County at the time of project closeout the following and before certificate of final payment is issued.
   1. Test Report: Submit computer-generated test records of measured resistance values for inclusion into the Operation and Maintenance Manual.
   2. As-Built Drawings, consisting primarily of the Communications Grounding Backbone (not necessarily each bonded component or apparatus)

1.06 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 27 00 00.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of Section 27 00 00.

1.08 WARRANTY

A. Warrant Work to perform as described within this Section for a period of 1 year. Correct deficiencies within 24 hours of notification.

PART 2 - PRODUCTS

2.01 GROUNDING AND BONDING CONDUCTORS

A. Application: Suitable for indoor installation as a BCT, TBB, GE, and/or TBC.

B. Type: THHN (or THWN)

C. Approvals:
   1. UL 83 as Type THHN
   2. Federal Specification A-A-59544, NEMA WC-5, UL-758

D. Conductor: soft drawn annealed copper, stranded

E. Gauge: Refer to System Description for conductor sizing criteria.

F. Insulation: PVC, high-heat and moisture resistant

G. Jacket: Nylon, abrasion, moisture, gasoline and oil resistant

H. Color: green

I. Flame Resistance: Meet the flame resistance requirements of IEEE 383, CSA FT-4 and UL VW-1.

2.02 CONNECTOR – "PARALLEL" TAP

A. Application: H-type thick wall compression tap, for making conductor–to–conductor (e.g., TBB-to-TBC) permanent connection (pigtailing, tapping, or splicing). Connectors shall be UL Listed.

B. Manufacturers:
   1. Panduit
      a. #HTCT2-2-1; "H-type" compression tap, run = #6-#2, tap = #2-#6.
      b. #HTCT250-2-1; "H-type" compression tap, run = #2-250MCM, tap = #6-#2
   2. Or equal

2.03 CONNECTOR – "C" TAP

A. Application: C-type copper thick wall compression tap, for making conductor–to–conductor (e.g., TBB-to-TBC) permanent connection (pigtailing, tapping, or splicing). Connectors shall be UL Listed.

B. Manufacturer:
   1. Panduit
      a. #CTAPF4-12-C; CTAP for #6 AWG run –to– #6 AWG tap
      b. #CTAPF2-12-C; CTAP for #2 AWG run –to– #6 AWG tap
      c. #CTAPF1/0-12-L; CTAP for 1/0 AWG run –to– #6 AWG tap
      d. #CTAPF2/0-12-Q; CTAP for 2/0 AWG run –to– #6 AWG tap
      e. #CTAPF3/0-12-Q; CTAP for 3/0 AWG run –to– #6 AWG tap
   2. Or equal

2.04 GROUNDING BUSBAR

A. General: Busbar shall be UL listed.

B. Standards: Compliant to ANSI-J-607-A

C. Material: Solid copper

D. Holes: Predrilled, compatible with standard NEMA bolt hole sizing and spacing and with ANSI-J-607-A recommendations for 2-hole lugs.

E. Mounting: Wall-mounted with standoffs. Standoffs shall insulate busbar from the mounting substrate.

F. Manufacturer:
   1. Chatsworth Products Inc.
      a. #13622-020; busbar, 20”L x 4”W x ¼”T, TMGB hole pattern
      b. #13622-012; busbar, 12”L x 2”W x ¼”T, TGB hole pattern
   2. Or equal

2.05 CONNECTION TO STRUCTURAL STEEL

A. Application: Exothermic welds shall be used for cable-to-cable, cable-to-ground rod, and cable-to-structural steel.

B. Manufacturers:
   1. Cadweld
      a. Each particular type of weld shall use a kit unique to that type of weld
   2. Or equal

2.06 CONNECTOR – COMPRESSION LUG

A. Application: Conductor-to-busbar and/or –rack (or other flat surfaces) connection

B. Type: compression lug, standard or long barrel, two-hole (1/4 inch diameter 5/8 inch on center)

C. Manufacturers:
   1. Panduit
      a. #LCC6-14JAW-L; for 6 AWG conductor
      b. #LCC4-14ADW-L; for 4 AWG conductor
      c. #LCC2-14AW-Q; for 2 AWG conductor
      d. #LCC1-14AW-E; for 1 AWG conductor
      e. #LCC1/0-14AW-X; for 1/0 AWG conductor
      f. #LCC2/0-14AW-X; for 2/0 AWG conductor
   2. Or equal

2.07 CONNECTOR – SPLIT-BOLT, MECHANICAL TYPE

A. Application: Conductor-to-conductor (or other round component) connection

B. Type: split-bolt mechanical connector

C. Material: high-strength copper alloy

D. Manufacturers:
   1. Cooper B-Line
      a. #WB2GC; split bolt bonding clamp
   2. Panduit
      a. #SBC3-C; split bolt bonding clamp for #6 to #3 conductor
   3. Or equal

2.08 GROUND BUSHING

A. Plated malleable iron body with 150 degree Centigrade molded plastic insulating throat and lay-in grounding lug.

B. Manufacturers:
   1. OZ/Gedney BLG
   2. Thomas & Betts #TIGB series
   3. Or equal.

2.09 BONDING STRAPS

A. Cable Runway Bonding Straps
   1. Application: makes multiple sections of cable tray conductively continuous
   2. Conductor: Flexible braided straps with factory terminated connectors.
   3. Manufacturers:
      a. Chatsworth Products Inc.
         1) #12061-001
      b. Cooper B-Line
         1) #SB6691x7¾
      c. OZ/Gedney
         1) Type BJ

d. Thomas & Betts
   1) #3840 series
e. Or equal

B. Cable Tray Bonding Straps
   1. Application: makes multiple sections of cable runway conductively continuous
   2. Conductor: Flexible braided straps with factory terminated connectors.
   3. Manufacturers:
      a. Cooper B-Line
         1) #99-N1
      b. Thomas & Betts
         1) #FB95
      c. Or equal.

2.10 LABELS

A. Labels for Busbars
   1. Labels shall be machine-printable (such as by a laser printer or hand-held printer)
   2. Printable area should be approximately 2 inch wide x 0.5 inch high
   3. Printable area color shall be white
   4. Manufacturer:
      a. Panduit
         1) #C200X100FJJ; laser/ink jet labels, white – for busbars
      b. Or equal

B. Labels for Conductors
   1. Labels shall be machine-printable (such as by a laser printer or hand-held printer)
   2. Labels shall be adhesive-backed and have a self-laminating feature
   3. Printable area should be 1 inch wide x 0.5 inch high, or larger
   4. Printable area color shall be white
   5. Manufacturer:
      a. Panduit
         1) #S100X150YAJ; laser/ink jet labels, white – for #6 wires
         2) # S100X225YAJ; laser/ink jet labels, white – for #6 to #1/0 wires
      b. Or equal

2.11 MISCELLANEOUS

A. Wire Clamp
   1. Material: nylon, UV stabilized.
   2. Color: black
   3. Size: 0.25” holding diameter for 6 AWG; or size as required based on conductor size.
   4. Manufacturer:
      a. Richco Inc.
         1) #N4B-BLK

b. Or equal

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with the Execution requirements of Section 270000.

B. Work shall comply with the International Building Code, International Fire Code, National Electrical Code, UL 467, and ANSI-J-607-A standards, as well as local codes that may specify additional grounding and/or bonding requirements. If discrepancies between codes and/or standards arise, codes shall prevail, and then the more stringent requirement shall prevail, and as directed by the AHJ.

C. Install components to manufacturer's instructions and recommendations and as required per UL listing.

D. Identify grounding and bonding conductors and components according to local codes.

E. Terminations must be accessible for inspection and maintenance during the life of the system.

3.02 EXAMINATION AND PREPARATION

A. Prior to the start of this section's work, examine pathways and communications rooms for completeness, compatibility with the work of this section, and readiness for connections with the work of this section.

3.03 INSTALLATION

A. BCT, TBB, and GE Conductors
   1. Install BCT or TBB conductors in conduit and in a manner to protect them from physical damage.
   2. When routing BCT or TBB conductors through metallic conduit 3 feet or longer, bond the conductor to the conduit at both ends using a #6 AWG bonding conductor as a pigtail, an irreversible connection (preferably exothermic weld) for the conductor-to-pigtail connection, and insulated ground bushings at the conduit ends.
   3. Install the BCT or TBB conductor without splices.
      a. In the event that a splice is necessary, notify the Engineer in writing. Do not proceed with splicing work until the Engineer has accepted in writing the installation of a splice.
      b. Locate the splice in a telecommunications space and ensure accessibility.
      c. Perform the splice using an exothermic weld and an irreversible compression-type connector.

4. Where shown on the drawings, connect grounding conductors to structural steel using exothermic welds. Each particular type of weld shall use a kit unique to that type of weld.

B. TMGB and TGB Busbars
   1. Mount busbars as noted on Drawings and using insulating standoffs. If not noted on drawings, install busbars onto wall at 24 inches AFF located within 5 feet of backbone pathways or rack bay.

C. Panelboard Bonding
   1. Where a panelboard is located in the same communications room as a TMGB/TGB and serves that room, provide TBC between busbar and that panelboard's Alternating Current Equipment Ground (ACEG) bus (where equipped) or the enclosure.

D. Bonding
   1. Provide TBC and appropriate grounding hardware between the nearest TMGB/TGB and the equipment racks / rack bay, overhead cable support, vertical cable support, telecommunication conduits, primary pathways that enter/exit the room (if applicable), and other metallic telecommunication infrastructure components. Refer to Drawings for additional information.
   2. Minimum size: #6. If longer than 25 feet, size TBCs based on length using 2000 cmil per foot, up to 2/0 AWG.
   3. Install TBCs in a manner that will protect them from physical and mechanical damage.
   4. Routing:
      a. Route TBCs in the shortest possible path, using right angles for turns and routed parallel to building lines. Route on outside edges of wall plywood. Do not cut across the middle of the plywood taking space away from other equipment or components.
      b. Utilize a minimum 1-foot bend radius.
   5. Connection to TMGB/TGBs:
      a. Thoroughly clean busbars prior to attaching connectors to the busbar.
      b. Fasten connectors (e.g., lugs) to the busbar using matching size bolt, flat washer Belleville washer, and nut. Torque hardware set.
   6. Rack Bay Bonding
      a. Refer to Drawings for detailed diagrammatic requirements for bonding the rack bay.
      b. Bond equipment racks, frames, frame bays, cabinets, server racks, and other similar support systems located within the same room or space as the TMGB/TGB to the busbar.
      c. Use approved connectors for TBC-to-rack, -frame, and -cabinet connections.
      d. Rack bays may be bonded in series using either of the following configurations:
         1) Series: Provide a TBC from the TGB to the rack closest to the busbar; then provide a TBC to the other racks in the rack bay in series using a

common lug/connection per rack. The rack shall not be used as a 'conductor' in the series connection.

2) String: Provide one 'main' TBC from the TGB along the length of the rack bay, and provide a pigtail from the 'main' TBC per rack. Use an irreversible connection (such as "C" tap) for the 'main'-to-pigtail connection.

7. Overhead and Vertical Cable Support Bonding
   a. Bond overhead and vertical cable support located within the same room or space as the TMGB/TGB to the busbar.
   b. Provide either UL listed connectors and splice plates or UL Listed bonding strap to bond sections of overhead cable support for ground continuity. This requirement applies to runway sections and junctions within a single telecommunication room.
8. Termination Field Bonding
   a. Bond termination blocks to the TMGB/TGB within the same room or space. Termination blocks may be bonded in series, with the block closest to the TMGB/TGB bonded to the busbar. Refer to Drawings for detailed diagrammatic requirements for bonding the termination blocks.

3.04 LABELING

A. General Requirements
   1. Labeling, identifier assignment, and label colors shall conform to TIA/EIA-606-A Administration Standard and as approved by the Engineer before installation.
   2. Permanently label TBCs. Affix label as close as practical to each end of the conductor.

B. Label Format
   1. Provide permanent labels with machine-generated text; hand written labels will not be accepted.
   2. Labels on TBCs shall fully wrap around conductors with a self-laminating feature to provide permanent marking.

C. Identifier Assignment
   1. Separate label fields of the identifier with a hyphen.
   2. Assign identifiers according to current practice and as approved by the Engineer before installation.
   3. BCT and TBB
      a. First field: "BCT" or "TBB" (the conductor type).
      b. Second field: a unique sequential number, for example, "01".
      c. Example: "TBB-01"
   4. Ground Busbars
      a. First field: "TMGB" or "TGB" (the busbar type)
      b. Second field: the room's identity (TR identifier's suffix) where the busbar is installed; for example, "3A2.1".
      c. Example: "TGB-3A2.1"

5. TBC:
    a. First field: “TBC” (the bonding conductor type).
    b. Second field: The room identity where TBC exists; for example: “A1.1”.
    c. Third field: A unique sequential number; for example: “01”, “02”, etc.
    d. Fourth field: describe the device, equipment, component, or raceway being bonded.
    e. Example: “TBC-A1.1-01 (RACK BAY)”

3.05 GROUNDING BACKBONE RESISTIVITY MEASUREMENT

A. Measure ground resistance from each ground busbar to earth; record measurement. Provide additional grounding electrodes, bonding, and other elements as required to comply with resistance limits specified in this Section.

B. Submit computer-generated records of measured resistance values to Engineer for approval and for inclusion into the Operation and Maintenance Manual.

3.06 FINAL INSPECTION AND CERTIFICATION

A. Punch the Work of this Section compliant to the requirements of Section 27 00 00. Punching the Work of this Section may be combined with punching the rooms.

B. Comply with system acceptance and certification requirements of Section 27 00 00.

END OF SECTION 27 05 26

SECTION 27 05 28

COMMUNICATIONS BUILDINGS PATHWAYS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Pathway systems within buildings to support low voltage systems-namely cable hangers and rated sleeves.

B. Related Sections
   1. Comply with the Related Sections paragraph of Section 27 00 00.
   2. Section 27 05 33, “Communications Conduits and Boxes”
   3. Section 27 05 36, “Communications Cable Trays”
   4. Section 27 05 26, “Communications Grounding and Bonding”
   5. Section 27 11 00, “Communications Rooms”

1.02 REFERENCES

A. Comply with the References requirements of Section 27 00 00.

B. In additional to those codes, standards, etc., listed in 27 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
   1. Underwriters Laboratories (UL)
      a. UL 5, “Standard for Surface Metal Raceways and Fittings”
      b. UL 5A, “Nonmetallic Surface Raceways and Fittings”
      c. UL 5C, “Standard for Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits”
   2. Underwriters Laboratories (UL)
      a. UL 467, “Grounding and Bonding Equipment”

1.03 DEFINITIONS

A. Definitions of Section 27 00 00 apply to this Section.

B. In addition to those Definitions of Section 27 00 00, the following list of terms as used in this Section defined as follows:
   1. “Cable Hanger”: A cable support component often shaped (section view) similar to the letter J (thus gaining the nickname “J hanger”), metallic (most often steel) or non-metallic (most often thermoplastic); available in different sizes (to support different quantities of cables) and with different attachment hardware suiting multiple installation methods (e.g., wire support, beam flange clip, etc.).
   2. “Cable Strap”: A flexible cable support that generally ‘wraps’ around cables and ‘latches’ into a fixed position, most often textile, available in different sizes (to

support different quantities of cables) and with different attachment hardware suiting multiple installation methods (e.g., wire support, beam flange clip, etc.).

3. "Enclosure": The case or housing of apparatus, or the fence or walls surrounding an installation to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage.
4. "J Hanger" and "J Hook": nickname for cable hanger
5. "NEC": National Electrical Code (NFPA 70)
6. "NFPA": National Fire Protection Agency
7. "UL": Underwriters Laboratories

1.04 SYSTEM DESCRIPTION

A. Base Bid Work:
   1. The Work of this section includes planning and coordination with General Contractor (and other trades) of inside plant pathway systems and components, furnishing necessary materials, and labor and associated services required to install pathways.

B. Cable Hanger Systems
   1. Provide a complete cable hanger system compliant with requirements of the CEC (in particular, compliant with the requirements of Article 300.11), in accordance with NECA's "Standards of Installation" (pertaining to general electrical installation practices), compliant with applicable portions of NFPA 70B, in accordance with manufacturer's instructions, and in accordance with recognized industry practices. A "complete system" shall include cable hangers, supports, anchors, fasteners, and other required accessories.
   2. Provide cable hangers between primary pathways (or telecommunications rooms) and work area pathways and/or outlet locations at intervals up to 48 inches on center per a given route, at transitions downward/upward, and within 24 inches of an outlet stub/outlet location.
   3. Supports:
      a. Provide dedicated supports for cable hangers. Do not support cable hangers on ceiling grid support wires. Do not share supports with other trades. Do not support hangers from ductwork, piping, or other equipment hangers.
      b. Support Wires:
         1) Support wires shall consist of #12 drop wire (or as approved) with integral clip and fastener (such as power-actuated deck pin, beam flange, or other fastener appropriate for the use).
         2) Secure support wires at both ends in accordance with CEC.
      c. Support Rods:
         1) Support rods shall consist of 1/4 inch (6.3mm) or 3/8 inch (9.5mm) threaded or smooth rod and concrete anchor or beam flange clip or angled flange clip (as required for attachment to the building structure).
   4. Clearances (minimum):
      a. From fluorescent light fixtures, or other EMI sources = 6 inches (150 mm)
      b. From any motor = 48 inches (1,220mm)

c. From flue, hot water, steam line or other non-insulated heat sources = 12 inches (300 mm)

C. Surface Raceway
1. Provide a complete surface raceway system in accordance with NEC Article 386 <and or NEC Article 388 > where required by manufacturer's installations. Complete shall include base and cover straight sections, couplers, corners, 'T' junctions, feed connectors, compartment dividers, end caps, and hardware required for a fully enclosed pathway system that fully houses and conceals cables and wires. Refer to Drawings for locations and routes.
2. Surface raceway shall be mechanically and electrically continuous. Bond surface raceway system to approved electrical ground in accordance with NEC Article 250 and ANSI-J-STD-607-A. Provide bonding straps where necessary to assure electrical continuity.
3. Surface raceway shall have a minimum two inch radius control at all bend points.
4. Coordinate raceway lengths with building walls, counter, and other actual field conditions. Raceways mounted above benches and counters shall align with each end of bench or counter, within 1/16-inch tolerance.
5. Finish:
   a. Paint surface raceway system to match existing walls.
   b. Touch up any marks, blemishes or other finish damage suffered during installation.

D. Spiral Wrap
1. Provide spiral wrap to support and dress cables from feed pathways to the point where the cables enter the furniture system.

1.05 SUBMITTALS

A. General: Conform to Submittal requirements as described in Section 27 00 00.

B. Quantity: Furnish quantities of each submittal as noted in Section 27 00 00.

C. Submittal Requirements Prior to the Start of Construction:
1. Product Data Submittal, showing product dimensions, fabrications materials, fabrication details, knockout sizes and locations, capacities, finishes, and accessories
2. Shop Drawings Submittal, consisting of proposed changes to pathways (routes, types, sizes, etc.) compared to the contract documents
3. Seismic Calculations for Anchoring and Bracing: Submit seismic calculations for support systems in conformance Section 27 00 00. Calculations shall be prepared and signed by a Structural Engineer registered in the state of California. If used, specify proof loads for drilled-in anchors.

D. Submittal Requirements at Close Out:
1. As-Built Drawings, showing the routes/locations, dimensions, types, sizes, quantities, etc., of pathways/pathway devices.

2. O&M Manual, including as-builts, a parts list, repair information, and detailing ongoing maintenance requirements

E. Substitutions
   1. Requests for substitutions shall conform to the general requirements and procedure outlined in Section 27 00 00.

1.06 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of section 27 00 00.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of section 27 00 00.

1.08 WARRANTY

A. Comply with Warranty requirements of section 27 00 00.

PART 2 - PRODUCTS

2.01 HANGERS AND STRAPS

A. Application: Suitable for indoor installation within ceiling space for the support of communications cables.

B. Hanger shall be rated for use in air handling space.

C. Hangers shall contain a closing loop, retainer, or latch to prevent cables from falling off the hanger.

D. Manufacturer:
   1. Eaton B-Line
      a. #BCH21-W2; for drop wire installation
      b. #BCH32-W2; for drop wire installation
      c. #BCH21; for wall installation
      d. #BCH32; for wall installation
   2. Erico
      a. #CAT12 (or variation per installation method); cable hanger
      b. #CAT21 (or variation per installation method); cable hanger
      c. #CAT32 (or variation per installation method); cable hanger
      d. #CAT425 (or variation per installation method); cable strap
   3. Panduit
      a. #JMJH2-X20
   4. Or equal

2.02 DROP WIRE

A. Application: Suitable for indoor installation within ceiling space into structure above (e.g., deck or slab) for the support of cable supports such as cable hangers.

B. Listings: UL 2043, for use in air handling spaces

C. Drop wire shall be equipped with pre-mounted ceiling clip, fastening pin, and pre-tied wire. Pin shall be 7/8". Wire shall be 12 gauge.

D. Manufacturers:
   1. Hilti #CC27 X-AL-H22P8T x ft. PT (100); drop wire assembly, "x" for length
   2. Armstrong #7891
   3. Dottie #CWC
   4. Garvin Industries
   5. Oregon Wire Products
   6. Or Equal

2.03 DROP ROD

A. Application: Suitable for indoor installation within ceiling space into building structure above (e.g., deck or slab) for the support of cable supports such as cable hangers.

B. Listings: UL 2043, for use in air handling spaces

C. Zinc plated for corrosion resistance

D. Manufacturers:
   1. CEAS #01014801; "Stiffy" straight rod, 1-1/4" power-actuated pin, 48 inches (or configured as required per instance)
   2. Or equal

2.04 SPIRAL WRAP

A. Application: Suitable for an indoor installation for the support of telecommunications cables from a feed pathway to furniture systems, or similar.

B. Material shall be flame retardant polyethylene (UL94V-0), or equivalent.

C. Color: Black.

D. Size: As required to support the given cable bundle size (e.g., 3/4" minimum).

E. Manufacturers:
   1. Panduit
   2. Or equal

2.05 SURFACE RACEWAY – SINGLE CHANNEL

A. Application: Pathway system specifically designed and intended for surface-mounting to walls that house, route, and protect communications (and other signal) wiring and, as applicable, power wiring, and present communications (and other signal) and power services via standard receptacles.

B. Material: Raceway's base, cover, couplers, and end plates shall be fabricated from cold rolled steel, 0.094 inch thickness minimum.

C. Size: Raceway size and length as shown on Drawings or, if not expressly shown, as required for the intended use.

D. Fittings: Boxes, extension rings, couplings, elbows, and connectors shall be designed for use with raceway system.

E. Finish: Primed and finished with power coated or similar 'paintable' finish.

F. Raceway shall be UL listed and labeled as such.

G. Assembly: Installed and fully assembled raceway shall fully house and conceal cables and wires, shall hold cables and wires securely in place (such as wire retention clips), shall accept the communications connectors as specified in Section 271513, shall accept wiring devices (e.g., NEMA 5-20R or similar) as specified in Division 26.

H. Double compartment / Two-channel raceway shall come factory pre-assembled, pre-cut and complete, including bases, covers, end plates, compartment dividers, wiring, receptacles, fittings and connections as required. U.L. labeled.

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with the Execution requirements of Section 27 00 00.

3.02 EXAMINATION AND PREPARATION

A. Prior to starting the work of this section, examine areas to receive pathways systems to verify conditions are ready for work and to verify conformance with manufacturer and specification tolerances. Notify the County's Representative in writing of conditions that would adversely affect the installation, or subsequent utilization, of the system. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Prior to installation, plan routes and locations of pathway systems and coordinate with other trades (ductwork, plumbing, electrical raceways, wall construction, ceilings, etc.). Pathway systems shall not unnecessarily cross other trade's work, shall not prevent removal of ceiling tiles or panels, and shall not block access to mechanical or

electrical equipment. Provide offsets as required to avoid obstruction of pathway systems with other trades.

3.03 INSTALLATION

A. Hangers and Straps
   1. Install hangers so they are accessible through the ceiling grid and are not blocked by other building infrastructure.
   2. Install hangers above ceiling grid to result in cables sag 6 to 12 inches (150 to 300 mm), minimum, above ceiling grid. Cables shall not rest on the ceiling grid and/or ceiling tiles.
   3. Where hangers have loops/retainers, close loop/retainer (latch after cable installation).

3.04 FINAL INSPECTION AN SURFACE RACEWAYS

A. Install surface raceway in accordance with NEC Article 352 and in accordance with ANSI/TIA-569-B.

B. Install surface raceway systems free from dents, bruises or deformations. Remove and replace any damaged products with new undamaged material.

C. Securely support surface raceway straight sections at intervals not exceeding 10 feet (3m) or in accordance with manufacturer's installation sheets. Securely fasten together straight sections and fittings using manufacturers' instructions and approved couplings and/or fasteners.

D. Install surface raceway level, plumb, and parallel/perpendicular to surfaces or exposed structural members. Follow surface contours where possible.

E. Use flat-head screws to fasten base to surfaces/substrate.

F. Close unused raceway openings.

G. Vacuum clean surface raceway after installation.

3.05 D CERTIFICATION

A. Punch the Work of this Section compliant to the requirements of Section 27 00 00.

B. Comply with system acceptance and certification requirements of Section 27 00 00.

END OF SECTION 27 05 28

SECTION 27 05 33

COMMUNICATIONS BUILDING PATHWAYS – CONDUITS AND BOXES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Pathway systems within buildings consisting of conduit and boxes (outlet, device, pull, and other boxes) to support low voltage systems.

B. Related Sections
   1. Comply with the Related Sections paragraph of Section 27 00 00.
   2. Section 27 05 26, “Communications Grounding and Bonding”
   3. Section 27 11 00, “Communications Rooms”

1.02 REFERENCES

A. Comply with the References requirements of Section 27 00 00.

B. In additional to those codes, standards, etc., listed in 27 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
   1. American National Standards Institute (ANSI)
      a. ANSI C80.1, “Specifications for Rigid Steel Conduit, Zinc Coated”
      b. ANSI C80.3, “Specifications for Electrical Metallic Tubing”
      c. ANSI C80.6, “Electrical Intermediate Metal Conduit”
   2. ASTM International
      a. ASTM A123, “Standard Specification of Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products”
      b. ASTM A653, “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process”
      c. ASTM D1654, “Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments”
   3. International Electronic Committee (IEC)
      a. ANSI/IEC 60529, “Degrees of Protection Provided by Enclosures (IP Code)”
   4. National Electrical Manufacturer Association (NEMA)
      a. NEMA 250, “Enclosures for Electrical Equipment (1000 volts maximum)”
      b. NEMA FB 1, “Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable”
      c. NEMA OS 1, “Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports”
      d. NEMA OS 2, “Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports”
      e. NEMA OS 3, “Selection and Installation Guidelines for Electrical Outlet Boxes”

5. Underwriters Laboratories (UL)
   a. UL 1, "Flexible Metal Conduit"
   b. UL 6, "Electrical Rigid Metal Conduit -Steel"
   c. UL 50, "Enclosures for Electrical Equipment, Non-Environmental Considerations"
   d. UL 360, "Liquid-Tight Flexible Steel Conduit"
   e. UL 467, "Grounding and Bonding Equipment"
   f. UL 514A, "Metal Outlet Boxes"
   g. UL 514B, "Conduit, Tubing, and Cable Fittings"
   h. UL 797, "Electrical Metallic Tubing - Steel"
   i. UL 1242, "Electrical Intermediate Metal Conduit - Steel"

1.03 DEFINITIONS

A. Definitions of Section 27 00 00 apply to this Section.

B. In addition to those Definitions of Section 27 00 00, the following list of terms as used in this Section defined as follows:
   1. "Backbox": A box [*see* "Box"] used to house cable terminations, to house devices, and to interface with cords/equipment; a backbox is installed with walls (such as within the cavities of framed walls and/or cast-in-place within concrete walls) such that the outlet/device finish (e.g., the coverplate/faceplate) is flush with the wall finish
   2. "Box": A box (often 5-sided with 1 side open) manufactured of sheet metal with welded corners, drawn metal, cast metal, or nonmetallic material (thermoplastic) in accordance with NEMA OS 1 or NEMA OS 2 and installed in accordance with NFPA 70 Article 314; available in different sizes (volumes) and modular design configurations (gangable) that may be field assembled, one to another, to accommodate multiple devices; boxes may be used as outlet boxes, device boxes, backboxes, junction boxes, or pull boxes, depending on their intended use, and handhole enclosures.
   3. "CEC": California Electrical Code (California Code of Regulations, Title 24 Part 3)
   4. "Device Box": A box [*see* "Box"] with provisions for attaching and housing electrical devices (switches, receptacles, or similar wiring devices) manufactured in accordance with NEMA OS 1 and NEMA OS 2 and installed in accordance with NFPA 70 Article 314; available in different sizes (volumes) and modular design configurations (gangable) that may be field assembled, one to another, to accommodate multiple devices
   5. "EIMC": Electrical Intermediate Metal Conduit – see "IMC"
   6. "EMT": Electrical Metallic Tubing type conduit, as defined in ANSI C80.3 and NFPA 70 Article 358 An unthreaded thinwall raceway, generally made of steel (ferrous) with protective coatings or aluminum (nonferrous), of circular cross section designed for the physical protection and routing of conductors and cables and for use as an equipment grounding conductor when installed utilizing

appropriate fittings (per NEC Article 358)"FMT: Flexible Metal Tubing type conduit, as defined in NFPA 70 Article 360

8. "Floor Box": A box [*see* "Box"] used to house cable terminations, to house wiring devices, and to interface with cords/equipment; a floor box is a special purpose box installed with floors (such as cast-in-place within concrete) such that the box finish (e.g., the coverplate) is flush with the floor finish
9. "IMC": Intermediate Metal Conduit type conduit, as defined in ANSI C80.6 and NFPA 70 Article 342
10. "Junction Box": A box used to join different runs of raceway (such as conduit) or cables, or both, and to provide space for the connection and branching of the enclosed conductors; most boxes can be used solely as junction boxes as long as they are used with an appropriate cover and with appropriate (code-required) access
11. "LFMC": Liquidtight Flexible Metal Conduit type conduit, as defined in NFPA 70 Article 353
12. "Outlet Box": A box [*see* "Box"] used to house cable terminations (connectors, modular jacks, receptacles, or similar wiring interfaces) and to interface with cords/equipment
13. "NEC": National Electrical Code (NFPA 70)
14. "NEMA": National Electrical Manufacturers Association
15. "NFPA": National Fire Protection Agency
16. "Pull Box": A box used in a conduit-based pathway system to allow access to and enclose conduit ends for placing cables and to house the interface between duct banks segments
17. "RMC": Rigid Metal Conduit type conduit, as defined in NFPA 70 Article 344 and ANSI C80.1
18. "UL": Underwriters Laboratories

1.04 SYSTEM DESCRIPTION

A. The scope of work of this section includes planning and coordination with General Contractor and other trades of inside plant conduit pathway systems, furnishing necessary materials, and labor and associated services required to install these pathway systems.

B. The drawings do not explicitly show on plans each and every conduit run needed for the project. Apply the guidelines described in this section and on the drawings to support the cabling described in Division 27 and shown on the low voltage drawings, and provide reasonably inferred standard conduits, fittings, and products required to complete the conduit installation to meet the design intent.

C. The scope of work includes conduit, boxes, and related construction materials that may not be expressly specified herein or expressly called out on the drawings, such as: 1- and 2-hole straps, nail straps, clamps and clamp backs, strut clamps, U-bolts, pipe hangers, clip-in and bolted hangers, bushings, ground bushings, service entrance cap/weatherhead, pull rope/tape, etc.

D. The scope of work includes basic construction materials that may not be explicitly specified herein or called out on the drawings, such as: concrete anchors, inserts, and/or expansion bolts; concrete fasteners; powder-actuated pins; construction channel/strut; threaded rod; wood fasteners (lag screws); beam clamps; purlin clips; stud box supports/brackets; floor-mount box supports; T-bar ceiling box support bar; channel-mount box supports; bonding pigtails; drywall ring (for ring & string); etc.

E. Conduit Systems, including Pull Boxes
   1. Provide conduit systems in accordance with CEC (Chapter 3 and Article 250), UL listing information, manufacturer's instructions, and compliant to local inspections and seismic restraint requirements. Conduit systems shall conform to ANSI/TIA-569-B standard and BICSI TDMM guidelines. Complete shall include all reasonably inferred conduits, fittings, connectors, couplers, straps, pull boxes, supports, etc., necessary for a complete installation to meet the intended application whether noted, indicated or specified in the Contract Documents or not. Duct bank routes and pull and junction box locations and elevations shown on the Drawings are diagrammatic in nature. Field verify route prior to installation.
   2. Provide pull boxes as necessary to facilitate proper cable placement, including the following:
      a. no more than 180 degrees bend between placement points
      b. no more than 150-200 feet conduit length (depending on the total bend between end points)
      c. to meet AHJ requirements
   3. Seismic Bracing: Provide seismic bracing to conduit system (duct banks, pull boxes, etc.). Seismic bracing shall be approved by a structural engineer licensed in the state of California.
   4. Seismic Joints: Provide seismic joints to conduit at building seismic joints. Seismic joint configurations shall be approved by a structural engineer licensed in the state of California.
   5. Expansion Joints/Fittings: Provide expansion joints and/or fittings to conduit where necessary. Expansion joints/fittings shall be approved by a structural engineer licensed in the state of California.
   6. Conduit systems shall be mechanically and electrically continuous throughout. Where EMT and associated fittings are used as part of equipment grounding system, provide a bonding type locknut where hub type fitting terminates into a threadless opening and provide compression ring type fittings for terminating and coupling.
   7. Minimum Conduit Size: Refer to drawings. If not noted on the drawings, the minimum conduit size shall be 1".
   8. Bend radii for conduit trade sizes 63.5 mm (2-1/2") and larger shall be 10 times the conduit outside diameter (OD) and bend radii for conduit trade sizes 51 mm (2") and smaller shall be 8 times the conduit OD.
   9. Provide transition couplings where dissimilar conduit types are joined.
   10. Conduit bodies or 'condulets' (LBs, etc.) are prohibited for telecommunications and audiovisual cables.

11. For type EMT conduits:
    a. Provide steel (preferred) zinc plated or die cast set screw (or compression fittings). For set screw fittings, provide single screw fittings (e.g., 1-screw connectors and 2-screw couplers) for 37mm (1.5") and smaller conduits and provide double screw fittings (e.g., 2-screw connectors and 4-screw couplers) for 51mm (2") and larger conduits.
    b. When cast in concrete, embedded masonry, or installed in dry locations (as defined by CEC provide compression fittings and couplings.
    c. When installed in damp locations (as defined by CEC), provide rain-tight type fittings and couplings.
12. For types IMC and RMC conduits:
    a. Provide steel (preferred), zinc plated or die cast threaded fittings (set screw and/or bolt-on fittings are prohibited). Provide steel locknuts and metal bushings. Provide bonding type bushings where necessary for conductive continuity or for bonding to ground.
13. When attaching to concrete ceilings, provide vibration and shock resistant bases.
14. Conduit Straps: Provide steel straps – for interior applications, provide straps without spacers
15. For unused conduits, provide a mechanical-type seal/cap for protection and to keep the conduit free from debris.
16. Provide a pull line into each conduit/duct between pull points.
    a. Where boxes are exposed in damp or wet locations or located in hazardous areas, provide cast metal boxes with gasketed cast metal cover plates.
    b. Provide supports for pull (and junction) boxes independently of conduit system and directly to the structure above. Provide seismic bracing for pull boxes.
17. Labeling:
    a. Provide permanent labels on conduit ends and pull box lids.
18. Conduit Application
    a. At interior concealed or exposed applications, 4" and smaller, provide EMT type conduit, unless otherwise note. EMT is the he preferred conduit type.
    b. IMC and RMC will be allowed for telecommunications and other low voltage systems with written approval from the Engineer.
    c. LFMC is allowed for telecommunications (and other low voltage systems) only for short spans requiring flexible connections. When used, upsize LFMC 1 full trade size (to allow for a derating of the fill capacity).
    d. FMC is not allowed for telecommunications (and other low voltage systems) without written approval from the Engineer.

F. Clearances (minimum):
    1. From fluorescent light fixtures, or other EMI sources = 6 inches (150 mm)
    2. From any motor, transformer = 48 inches (1,220mm)
    3. From flue, hot water, steam line or other non-insulated heat sources = 12 inches (300 mm)
    4. No conduit and/or supports shall encroach into ceiling height, head room of walkways, and/or doorways.

G. Penetrations:
   1. When penetrating partitions and other construction assemblies, use approved methods.
   2. When penetrating concrete walls (including shear walls) and/or floors, scan the area to be penetrated and core openings using methods approved by the structural engineer and by the AHJ. Obtain written approval for locations and means when not using methods included in the contract documents.
   3. When penetrating fire rated assemblies, provide UL Classified and FM Approved fire rated systems in accordance with ASTM E814 (UL1479). Provide labels at both sides of the penetration. Refer to drawings for approved systems per application.
   4. When penetrating acoustic rated assemblies, provide sealant to fill gaps, cavities, etc., to fully seal penetration.

H. Outlet Boxes
   1. Provide outlet boxes and covers/rings (raised and/or flat) in accordance with CEC Article 314 and NEMA OS 3. Ground and bond metal outlet boxes in accordance with NEC Article 250, Parts I, IV, V, VI, VII, and X.
   2. Provide support for outlet boxes. Outlet boxes for telecommunications and audiovisual may share a support bracket (such as a stud span bracket) with electrical outlet boxes.

1.05 SUBMITTALS

A. General: Conform to Submittal requirements as described in Section 27 00 00.

B. Quantity: Furnish quantities of each submittal as noted in Section 27 00 00.

C. Submittal Requirements Prior to the Start of Construction:
   1. Product Data: Submit product data showing manufacturer, part numbers, listings, fabrication materials, dimensions, capacities, finishes, knockout sizes and configuration, accessories, etc.
   2. Shop Drawings: Submit shop drawings consisting of the following:
      a. Conduit layout/routes, supports locations, support details
      b. Highlight proposed changes to pathways (routes, types, sizes, etc.) compared to the contract documents
      c. Clearance variations and/or requests for exceptions
      d. Seismic bracing details (also see “Seismic Calculations” below)
      e. Instances of penetrations through fire and smoke rated barriers, including calling out firestopping type/UL System, size, quantity, and other relevant information
   3. Seismic Calculations: Submit seismic calculations for support systems in conformance Section 27 00 00. Structural Calculations shall be prepared and signed by a California Registered Structural Engineer. If used, specify proof loads for drilled-in anchors.

D. Submittal Requirements at Close Out:
   1. As-Built Drawings, showing the routes, types, sizes, quantities, dimensions, etc., of pathways (backbone pathways, primary pathways, conduit – required; secondary such as hangers – not necessary)
   2. O&M Manual, including as-built drawings, parts list (essentially final approved product data submittal), repair information, and maintenance requirements

E. Substitutions
   1. Requests for substitutions shall conform to the general requirements and procedure outlined in Section 27 00 00.

1.06 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of section 27 00 00.

B. NEC Compliance: Comply with NEC, as applicable to construction and installation of conduit and boxes.

C. NFPA Compliance: Comply with NFPA 70B, "Recommended Practice for Electrical Equipment Maintenance" pertaining to conduit and boxes.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of section 27 00 00.

1.08 WARRANTY

A. Comply with Warranty requirements of section 27 00 00.

PART 2 - PRODUCTS

2.01 ELECTRICAL METALLIC TUBING (TYPE EMT) CONDUIT AND FITTINGS

A. Application: Products and assembled system shall be suitable for indoor applications, in accordance with the NEC Article 358

B. Type EMT Conduit:
   1. Type EMT conduit shall be formed of cold rolled strip steel, electrical-resistance welded continuously along the longitudinal seam, and zinc coated after welding. Type EMT conduit bore shall be smooth and free of blisters, nicks or other imperfections which could mar cables.
   2. Type EMT conduit shall be listed by a nationally recognized testing laboratory to UL 797, and shall bear (stamped or molded on conduit and fittings) the UL label. Markings shall be permanent. Type EMT conduit shall meet ANSI C80.3 specifications.
   3. Type EMT conduit shall be recognized as a bonding conductor per NEC Article 250.118

4. Factory elbows and bends minimum bend radius shall be 48".
5. Manufacturers – Type EMT Conduit:
   a. Allied Tube and Conduit Co (Electrical Group) "E-Z Pull" EMT conduit
   b. Cal Conduit Products "CalBrite" EMT conduit
   c. Republic Conduit
   d. Western Tube and Conduit Corp
   e. Or equal

C. Fittings for EMT:
1. Fittings (connectors, couplers, straps, accessories, etc.) shall be listed by a nationally recognized testing laboratory to UL 514B, and shall bear the UL label (stamped or molded - such markings shall be permanent).
2. Fittings shall be manufactured compliant to ANSI/NEMA FB 1.
3. Standard Set-Screw Fittings: fabricated of steel with zinc electro-plated finish. Die cast zinc / cast malleable iron fittings not acceptable. Set-screws shall be case-hardened steel with hex head and cup point to firmly seat in wall of conduit for positive grounding.
4. Compression Fittings: gland and ring compression type construction; fabricated of steel zinc plated or cast malleable iron; UL Listed as raintight and suitable for concrete
5. Manufacturers – Fittings for EMT
   a. Appleton Electric Co and/or O-Z Gedney (Emerson Electric Co)
   b. Thomas & Betts Corp
   c. Or equal

D. Deflection/Expansion Sleeve:
1. Application: Deflection/expansion sleeve shall compensate for movement in any direction between two conduit ends and shall withstand occasional vibration transmitted to conduit by rotating equipment or vehicular traffic.
2. Deflection/expansion sleeve shall be listed by a nationally recognized testing laboratory to UL 514B and UL 467, and shall bear the UL label (stamped or molded - such markings shall be permanent).
3. Deflection/expansion sleeve shall be fabricated of an inner sleeve, bonding braid, a neoprene outer sleeve with internal flexible stainless steel braid and outer stainless steel bands, ended with couplings (for connection to conduits).
4. Deflection/expansion sleeve shall accommodate 0.75 inch (19mm) deflection, expansion, contraction, or parallel misalignment in any direction, shall allow up to 30 degree angular deflections, and shall be raintight.
5. Manufacturer – EMT Expansion/Deflection Sleeve:
   a. Cooper Crouse-Hinds XD series
   b. O-Z Gedney (Emerson Electric Co) DX series
   c. Or equal

E. Expansion Sleeve:
1. Application: Expansion sleeve shall compensate for parallel movement between two conduits.

2. Expansion sleeve shall comply with UL514.B and NEMA FB-1.
3. Expansion sleeve shall be fabricated of an inner steel sleeve with an oversized outer sleeve sealed with slip bushings, configured such that the outer sleeve can move over the inner sleeve. Sleeve shall come equipped with internal or external bonding braid and be ended with couplers suitable to connect to conduit ends.
4. Manufacturers – EMT Expansion Sleeve:
   a. Cooper Crouse-Hinds XJG-EMT series
   b. O-Z Gedney (Emerson Electric Co) TX series
   c. Or equal

2.02 INTERMEDIATE METAL CONDUIT (TYPE IMC) AND FITTINGS

A. Application: Products and assembled system shall be suitable for indoor applications, in accordance with the NEC Article 342

B. Type IMC Conduit:
1. Type IMC conduit shall be fabricated of hot dip galvanized steel. The conduit bore shall be smooth and free of blisters, nicks or other imperfections which could mar cables.
2. Type IMC conduit shall be listed by a nationally recognized testing laboratory to UL 1242, and shall bear (stamped or molded on conduit and fittings) the UL label. Markings shall be permanent. Type IMC conduit shall meet ANSI C80.6 specifications.
3. Type IMC conduit shall be recognized as a bonding conductor per NEC Article 250.118
4. Factory elbows and bends minimum bend radius shall be 48”.
5. Manufacturers – Type IMC Conduit:
   a. Allied Tube and Conduit Co (Electrical Group) “Kwik-Couple” conduit
   b. Western Tube and Conduit Corp
   c. Or equal

C. Fittings for IMC:
1. Fittings, connectors, couplers, straps, accessories, etc., shall be listed by a nationally recognized testing laboratory to UL 514B, and shall bear (stamped or molded on conduit and fittings) the UL label. Markings shall be permanent.
2. Fittings, connectors, couplers, straps, accessories, etc., shall be manufactured compliant to ANSI/NEMA FB 1
3. Fittings, connectors, couplers, etc., shall be threaded - raintight and concrete tight where required by application.
4. Standard threaded couplings, locknuts, bushings, and elbows shall be fabricated of steel or malleable iron. Locknuts shall be bonding type with sharp edges for digging into the metal wall of an enclosure. Three piece couplings: Electroplated, cast malleable iron.
5. Manufacturers – Fittings for IMC
   a. Appleton Electric Co and/or O-Z Gedney (Emerson Electric Co)
   b. Thomas & Betts Corp

c. Or equal

D. Deflection/Expansion Sleeve:
   1. Application: Deflection/expansion sleeve shall compensate for movement in any direction between two conduit ends and shall withstand occasional vibration transmitted to conduit by rotating equipment or vehicular traffic.
   2. Deflection/expansion sleeve shall comply with UL467 and UL514.
   3. Deflection/expansion sleeve shall be fabricated of an inner sleeve, bonding braid, a neoprene outer sleeve with internal flexible stainless steel braid and outer stainless steel bands, ended with couplings (for connection to conduits).
   4. Deflection/expansion sleeve shall accommodate 0.75 inch (19mm) deflection, expansion, contraction, or parallel misalignment in any direction, shall allow up to 30 degree angular deflections, and shall be raintight.
   5. Manufacturer – EMT Expansion/Deflection Fitting/Sleeve:
      a. O-Z Gedney (Emerson Electric Co) DX series
      b. Thomas & Betts XD series
      c. Or equal

E. Expansion Sleeve:
   1. Application: Expansion sleeve shall compensate for parallel movement between two conduits.
   2. Expansion sleeve shall comply with UL514.B and NEMA FB-1.
   3. Expansion sleeve shall be fabricated of an inner steel sleeve with an oversized outer sleeve sealed with slip bushings, configured such that the outer sleeve can move over the inner sleeve. Sleeve shall come equipped with internal or external bonding braid and be ended with couplers suitable to connect to conduit ends.
   4. Manufacturers – IMC (and/or RMC) Expansion Sleeve:
      a. Cooper Crouse-Hinds XJG series
      b. O-Z Gedney (Emerson Electric Co) TX series
      c. Or equal

F. Expansion Sleeve At Box Termination:
   1. Application: Expansion sleeve shall compensate for parallel movement between a conduit and a junction box/enclosure.
   2. Expansion sleeve shall comply with UL514.B and NEMA FB-1.
   3. Expansion sleeve shall be sealed sleeve design fabricated of malleable or ductile iron heads and steel sleeve.
   4. Manufacturers – IMC (and/or RMC) Expansion Sleeve:
      a. O-Z Gedney (Emerson Electric Co) Type EXE series
      b. Or equal

2.03 RIGID METAL CONDUIT (TYPE RMC) AND FITTINGS

A. Application: Products and assembled system shall be suitable for indoor applications, in accordance with the NEC Article 344

B. Type RMC Conduit:
   1. Type RMC conduit shall be fabricated of steel, galvanized inside and out (e.g., hot dip galvanized). Pre-threaded conduit ends shall be hot dip galvanized after cutting. Type RMC conduit bore shall be smooth and free of blisters, nicks or other imperfections which could mar cables.
   2. Type RMC conduit shall be listed by a nationally recognized testing laboratory to UL 6, and shall bear (stamped or molded on conduit and fittings) the UL label. Markings shall be permanent. Type RMC conduit shall meet ANSI C80.1 specifications.
   3. Type RMC conduit shall be recognized as a bonding conductor per NEC Article 250.118
   4. Factory elbows and bends minimum bend radius shall be 48".
   5. Manufacturers – Type RMC Conduit:
      a. Allied Tube and Conduit Co (Electrical Group) "Kwik-Couple" conduit
      b. Western Tube and Conduit Corp
      c. Or equal

C. Fittings for RMC Conduit:
   1. Fittings, connectors, couplers, bushings, straps, accessories, etc., shall be listed by a nationally recognized testing laboratory to UL 514B, and shall bear (stamped or molded on conduit and fittings) the UL label. Markings shall be permanent.
   2. Fittings, connectors, couplers, bushings, straps, accessories, etc., shall be manufactured compliant to ANSI/NEMA FB 1.
   3. Fittings, connectors, couplers, bushings, etc., shall be threaded – rain-tight and concrete-tight where required by application.
   4. Fabrication Materials:
      a. Connectors, couplers, and similar fittings: steel/zinc (preferred), die cast zinc, or malleable iron; 3-piece couplings: electroplated, cast malleable iron.
      b. Locknuts: steel, zinc-coated; bonding type locknuts shall have sharp edges for digging into the metal wall of an enclosure (to establish conductive connection with enclosure)
      c. Insulating bushings: die cast zinc with thermoplastic liner rated >100 degree C
   5. Manufacturers – Fittings for RMC
      a. Appleton Electric Co and/or O-Z Gedney (Emerson Electric Co)
      b. Thomas & Betts Corp
      c. Or equal

D. Deflection/Expansion Sleeve:
   1. Application: Deflection/expansion sleeve shall compensate for movement in any direction between two conduit ends and shall withstand occasional vibration transmitted to conduit by rotating equipment or vehicular traffic.
   2. Deflection/expansion sleeve shall comply with UL467 and UL514.
   3. Deflection/expansion sleeve shall be fabricated of an inner sleeve, bonding braid, a neoprene outer sleeve with internal flexible stainless steel braid and outer stainless steel bands, ended with couplings (for connection to conduits).

4. Deflection/expansion sleeve shall accommodate 0.75 inch (19mm) deflection, expansion, contraction, or parallel misalignment in any direction, shall allow up to 30 degree angular deflections, and shall be raintight.
5. Manufacturer – EMT Expansion/Deflection Fitting/Sleeve:
   a. O-Z Gedney (Emerson Electric Co) DX series
   b. Thomas & Betts XD series
   c. Or equal

E. Expansion Sleeve:
1. Application: Expansion sleeve shall compensate for parallel movement between two conduits.
2. Expansion sleeve shall comply with UL514.B and NEMA FB-1.
3. Expansion sleeve shall be fabricated of an inner steel sleeve with an oversized outer sleeve sealed with slip bushings, configured such that the outer sleeve can move over the inner sleeve. Sleeve shall come equipped with internal or external bonding braid and be ended with couplers suitable to connect to conduit ends.
4. Manufacturers – RMC (and/or IMC) Expansion Sleeve:
   a. Cooper Crouse-Hinds XJG series
   b. O-Z Gedney (Emerson Electric Co) TX series
   c. Or equal

F. Expansion Sleeve at Box Termination:
1. Application: Expansion sleeve shall compensate for parallel movement between a conduit and a junction box/enclosure.
2. Expansion sleeve shall comply with UL514.B and NEMA FB-1.
3. Expansion sleeve shall be sealed sleeve design fabricated of malleable or ductile iron heads and steel sleeve.
4. Manufacturers – RMC (and/or IMC) Expansion Sleeve:
   a. O-Z Gedney (Emerson Electric Co) Type EXE series
   b. Or equal

2.04 LIQUID-TIGHT FLEXIBLE METAL CONDUIT (TYPE LFMC) AND FITTINGS

A. Application: Products and assembled system shall be suitable for indoor applications, in accordance with the NEC Article 350

B. Type LFMC Conduit:
1. Type LFMC conduit shall be fabricated in continuous lengths from of single strip, flexible continuous, interlocked, and double-wrapped steel; galvanized inside and outside; coated with liquid-tight jacket of flexible polyvinyl chloride (PVC).
2. Type LFMC conduit shall be listed by a nationally recognized testing laboratory to UL 360, and shall bear (stamped or molded on conduit and fittings) the UL label. Markings shall be permanent.
3. Manufacturers:
   a. AFC Cable Systems, Inc. (a part of Atkore International)
   b. ANAMET Electrical (a.k.a., Anaconda Sealtite)

c. Electri-Flex Company
d. Southwire Company
e. Or equal

C. Fittings for LFMC:
1. Connector body and gland nut shall be of cadmium plated steel or cast malleable iron, with tapered, male, threaded hub; insulated throat and neoprene "O" ring gasket recessed into the face of the stop nut. The clamping gland shall be of molded nylon with an integral brass push in ferrule.
2. Manufacturers – Fittings for LFMC
a. Appleton Electric Co and/or O-Z Gedney (Emerson Electric Co)
b. Cooper Industries
c. Thomas & Betts Corp
d. Or equal

2.05 PULL TAPE

A. Application: for installing/placing low voltage cables into conduit/ducts

B. Description: flat, woven, polyester or Kevlar® tape
1. Lubricated (for easy pulling and reduced friction)
2. Durably printed with sequential footage or meter markings
3. UV resistant, and resistant to rot and mildew
4. Pulling strength: 273 kg (60lb), minimum
5. Low elongation

C. Manufacturers:
1. Neptco Inc. MULTETAPE®
2. Pacific Strapping Inc. HERCULINE®
3. Or equal

2.06 PULL STRING

A. Application: For use with manual or power fishing systems for light duty cable or tape pulling applications

B. Description: round, woven, polypropylene line
1. Packaged in storage container with easy, quick, and tangle-free dispensing
2. UV resistant, and resistant to rot and mildew
3. Low elongation

C. Manufacturers:
1. Ideal Industries Inc. Powr-Fish® or Valu-Line™ poly pull line
2. Klein Tools #56110 poly pull line
3. Or equal

2.07 PULL BOXES

A. Application: For use indoors as cable placement point (pull box) for low voltage cabling and wiring within a conduit raceway system.

B. Compliances:
   1. Pull boxes shall meet the requirements of UL 50 and NEMA Type 1.
   2. Pull boxes shall be listed by a nationally recognized testing laboratory for the purpose.

C. Material and Finish:
   1. Thickness: 16 gauge, minimum
   2. Material: the following materials are acceptable for pull boxes
      a. Pre-galvanized steel (ASTM A653), then formed
      b. Mild steel formed, then hot-dipped galvanized (per ASTM A123)
      c. Mild steel formed, then painted (polyester or epoxy powder coat, meeting ASTM D1654)

D. Size: pull box size shall comply with CEC 314.28

E. Configuration: pull boxes shall --- Covers shall be secured by machine screws at 6 inches intervals.

F. Manufacturers:
   1. Cooper B-Line (Eaton)
   2. Hoffman (Pentair)
   3. Hubbell Wiegmann (SC Series enclosures, as an example)
   4. Or equal

2.08 STEEL OUTLET BOXES AND COVERS

A. Application: For use indoors as outlet box, backbox, and/or junction box of low voltage systems to house wiring, cabling, terminations, and connectors; may also house and support components.
   1. Outlet boxes shall permit access to conductors for maintenance
   2. Outlet boxes shall come with knock-outs or punch-outs for easy creation of holes to accept conduit connectors.

B. Compliances:
   1. Outlet boxes shall meet the requirements of CEC Article 314.
   2. Outlet boxes shall be listed by a nationally recognized testing laboratory to UL 514A for Class 2 and Class 3 power-limited circuits (such as data and signal) providing bonding without the use of bonding jumpers, for remote control circuits, and for telecommunications circuits in accordance with NEC Article 314.
   3. Outlet boxes shall be manufactured compliant to NEMA: FB-1 and OS-1.
   4. Outlet boxes shall be fire resistant and suitable for use in rated spaces (reference: UL Fire Resistance Directory / “Orange Book”).

C. Material and Finish:
   1. Material: AISI/SAE 1008 Steel
   2. Thickness: CEC 314.40(B) / 1.59 mm (0.0625in), minimum
   3. Finish: G60 hot dip zinc galvanized (0.60 oz/sq ft), meeting ASTM A123, or pre-galvanized (continuous sheet galvanizing) meeting per ASTM A653
   4. Finish Thickness: ~0.0005 inches

D. Square Box and Covers/Rings – 5”
   1. Dimensions: 5 in square x 2.875 in deep
   2. Volume: 64 in^3
   3. Manufacturers:
      a. Randl Industries
         1) #T-55017; “5 Square” outlet box, knockouts: one 1” + one 1-1/4” per side, one 1/2” per back
         2) #T-55057; “5 Square” outlet box with side mounting bracket, knockouts: one 1” + one 1-1/4” on 3 sides, one 1/2” per back
         3) #R-55000; blank cover for “5 Square” outlet box
         4) #N-54000; 4”-sq cover for “5 Square” outlet box, flat
         5) #N-54012; 4”-sq cover for “5 Square” outlet box, 1/2" raised
         6) #N-54058; 4”-sq cover for “5 Square” outlet box, 5/8" raised
         7) #N-54034; 4”-sq cover for “5 Square” outlet box, 3/4" raised
         8) #N-54010; 4”-sq cover for “5 Square” outlet box, 1" raised
         9) #N-54114; 4”-sq cover for “5 Square” outlet box, 1-1/4" raised
         10) #N-54112; 4”-sq cover for “5 Square” outlet box, 1-1/2" raised
         11) #D-51G000; one gang cover for “5 Square” outlet box, flat
         12) #D-51G012; one gang cover for “5 Square” outlet box, 1/2" raised
         13) #D-51G058; one gang cover for “5 Square” outlet box, 5/8" raised
         14) #D-51G034; one gang cover for “5 Square” outlet box, 3/4" raised
         15) #D-51G010; one gang cover for “5 Square” outlet box, 1" raised
         16) #D-51G114; one gang cover for “5 Square” outlet box, 1-1/4" raised
         17) #D-52G000; two gang cover for “5 Square” outlet box, flat
         18) #D-52G012; two gang cover for “5 Square” outlet box, 1/2" raised
         19) #D-52G058; two gang cover for “5 Square” outlet box, 5/8" raised
         20) #D-52G034; two gang cover for “5 Square” outlet box, 3/4" raised
         21) #D-52G010; two gang cover for “5 Square” outlet box, 1" raised
         22) #D-52G114; two gang cover for “5 Square” outlet box, 1-1/4" raised
      b. Or equal

E. Square Box – 4-11/16”, Extra Deep
   1. Dimensions: 4-11/16 in square x 3 (or 3-1/4) in deep
   2. Volume: 66.7 in^3
   3. Box shall have standard 4-11/16 screw pattern (accept standard 4-11/16” covers/mud rings/tile covers/etc).
   4. Knock-outs: top, bottom: 3/4 in to 2 in; sides: 3/4" to 1-1/4”

5. Manufacturers:
   a. Gavin Industries
      1) #72181-1-1/4; 4-11/16" square x 3" deep box, welded
   b. RACO (Hubbell Electrical Products)
      1) #260; 4-11/16" square x 3-1/4" deep box, welded
      2) #981; Partition for 4-11/16" square x 3-1/4" deep box, and 1/2", 3/4" & 1-1/4" raised covers
   c. Or equal

F. Square Box – 4-11/16", Deep
   1. Dimensions: 4-11/16 in square x 2-1/8 in deep
   2. Volume: 42 in^3
   3. Box shall have standard 4-11/16 screw pattern (accept standard 4-11/16" covers/mud rings/tile covers/etc).
   4. Manufacturers:
      a. Appleton Electric Co and/or O-Z Gedney (Emerson Electric Co)
      b. Garvin Industries #72171-1-1/4 drawn 4-11/16"S x 2-1/8"D box, (4) 1-1/4" KOs
      c. RACO (Hubbell Electrical Products)
      d. Steel City (Thomas & Betts)
      e. Or equal

2.09 BOX SUPPORT ACCESSORIES

A. Box accessories shall comply with UL standards and shall be listed by a nationally recognized testing laboratory.

B. Stud-Mount Single-Box Bracket
   1. Erico #SGBS16A; stud-mount bracket, for 1-1/2" or 2-1/8"D box, fits 16" stud spacing
   2. Erico #SGBS24A; stud-mount bracket, for 1-1/2" or 2-1/8"D box, fits 24" stud spacing
   3. Garvin #BMB16218; stud-mount bracket, for 2-1/8"D box, fits 16" stud spacing
   4. Garvin #BMB16350; stud-mount bracket, for 3-1/2"D box, fits 16" stud spacing
   5. Garvin #BMB24218; stud-mount bracket, for 2-1/8"D box, fits 24" stud spacing
   6. Garvin #BMB24350; stud-mount bracket, for 3-1/2"D box, fits 24" stud spacing
   7. Garvin #BMB16SL; stud-mount bracket, 'sliding' position for 1-1/2" or 2-1/8" D box, fits 16" stud spacing
   8. Garvin #BMB24SL; stud-mount bracket, 'sliding' position for 1-1/2" or 2-1/8" D box, fits 24" stud spacing
   9. Raco #9004; fixed stud-mount bracket, for 2-1/8"D box, fits 16" stud spacing
   10. Raco #9006; fixed stud-mount bracket, for 2-1/8"D box, fits 24" stud spacing
   11. Raco #9013; adjustable stud-mount bracket, for 2-1/8"D box, fits 10-3/8" to 18" stud spacing
   12. Raco #9015; adjustable stud-mount bracket, for 2-1/8"D box, fits 15" to 26" stud spacing

C. Stud-Mount Multi-Box Bracket
   1. Erico #RBS16; stud-mount bracket, 3 positions for 4S and/or 4-11/16”S box, fits 16” stud spacing
   2. Erico #RBS24; stud-mount bracket, 4 positions for 4S and/or 4-11/16”S box, fits 24” stud spacing
   3. Garvin #BMB4S3P; stud-mount bracket, 3 positions for 4S and/or 4-11/16”S box, fits 16” stud spacing
   4. Raco #9002; stud-mount bracket, 3 positions for 4S and/or 4-11/16”S box, fits 16” stud spacing
   5. Raco #9002; stud-mount bracket, 4 positions for 4S and/or 4-11/16”S box, fits 24” stud spacing

D. Floor-Mount Box Mounting Bracket
   1. Erico #FMBS18; floor mount support bracket for box, puts box at 18.5” above wall footer
   2. Garvin #KP4-12; floor mount support bracket for 4S and/or 4-11/16”S box, puts box at 12” above wall footer
   3. Garvin #KP4-18; floor mount support bracket for 4S and/or 4-11/16”S box, puts box at 18” above wall footer
   4. Garvin #KP4-24; floor mount support bracket for 4S and/or 4-11/16”S box, puts box at 24” above wall footer
   5. Raco #9009; floor mount support bracket for 4S and/or 4-11/16”S box, puts box at 12” above wall footer
   6. Raco #9010; floor mount support bracket for 4S and/or 4-11/16”S box, puts box at 18” above wall footer

E. T-Bar Bracket
   1. Erico #510HD; bracket for outlet box, attaches to T-bar ceiling grid

F. T-Bar Support
   1. Erico #4ACS; adapter/support for outlet box, attaches to T-bar ceiling grid

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with the Execution requirements of Section 27 00 00.

3.02 EXAMINATION AND PREPARATION

A. Prior to installation, plan routes and locations of pathway systems and coordinate with other trades and building systems (ductwork, plumbing, electrical raceways, wall construction, ceilings, etc.). Pathway systems shall not unnecessarily cross other trade’s work, shall not prevent removal of ceiling tiles or panels, and shall not block access to mechanical or electrical equipment. Provide offsets as required to avoid obstruction of pathway systems with other trades/systems.

B. Prior to installation, examine areas to receive pathways systems to verify conditions are ready for work and to verify conformance with manufacturer and specification tolerances. Notify the County's Representative in writing of conditions that would adversely affect the installation, or subsequent

3.03 INSTALLATION

A. Secure raceway/pathway systems to building structures using approved support methods and components (fasteners, anchors, clamps, hangers, etc) and complaint to the CEC

B. Conduit Systems, including Pull Boxes
   1. Run conduit in groups/banks in the most direct route possible, parallel to building lines, and at elevations that avoid unnecessary offsets. Do not route conduit through areas in which flammable material may be stored, or over or adjacent to boilers, incinerators, hot water lines, or steam lines. Completed conduit systems installation shall not encroach into the ceiling height headroom of walkways or doorways.
   2. Trapeze Supported Conduit Runs
      a. Support conduit runs using "trapeze" hangers fabricated from construction channel and threaded steel rods anchored to building structures. Fasten conduit to construction channel using standard conduit clamps or equivalent.
      b. Seismically brace trapeze supports compliant to applicable codes.
   3. Surface-Mounted Conduit Runs
      a. Single Conduit Runs: Support single conduit runs to building structure using construction channel with approved anchors and hardware or using 2-hole (preferred) or 1-hole conduit straps (or similar support apparatus). Where installed in damp or wet locations, support conduit to building structure using conduit clamp such that clamp backs add space between conduit and mounting substrate.
      b. Multiple Conduit Runs: Support multi-conduit runs to building structure using construction channel with approved anchors and hardware. Select anchors based on installation substrate. Fasten conduit to construction channel using standard conduit clamps or equivalent.
      c. Install vibration control apparatus as required to meet isolation requirements.
   4. Install conduit free from dents, bruises or deformations. Remove and replace damaged conduits with new undamaged material.
   5. Install metallic conduit so as to not be in contact with other dissimilar metal pipes (e.g., plumbing) to minimize galvanic corrosion.
   6. Make bends and offsets using standard conduit bending hand tool and/or machines or use factory fittings. The use of any item not specifically designed for bending conduit is strictly prohibited.
   7. For conduits that turn up and protrude from finished concrete, extend conduits 25mm – 75mm (1" to 3") above the surface of the floor, unless conditions require other extension lengths.

8. For rigid and intermediate steel conduit:
    a. Ream conduit smooth after cutting and threading.
    b. Coat field-threaded joints with UL approved conductive type compound to ensure low resistance ground continuity through conduit and to prevent seizing and corrosion.
9. Pull Boxes: Install pull boxes and junction boxes at locations that are accessible. Install pull boxes and junction boxes at locations that are concealed, unless as noted on drawings; pull boxes and junction boxes may be exposed in electrical rooms, utility rooms, storage areas, or when installed in 'open' spaces (such as no ceilings). Adjust locations and installation as coordinated with construction conditions and as required for seismic bracing. Within ceiling space (e.g., above ceiling grid), do not install higher than 1m (~3') above grid.
10. Ream conduit ends cut in the field (non-factory) to eliminate sharp edges, burrs, etc.
11. Clean completed conduits of foreign matter and/or moisture (e.g., pull a bristle mandrel through).
12. Secure pull strings/mule tapes at conduit ends or within boxes to prevent recoiling back into duct.
13. After installation of conduit system and during ongoing general construction, protect conduits and tightly cover/seal open ends.
14. Leave no unused openings in any pull or junction box. Install close-up plugs as required to seal openings.
15. Label each conduit end in a clear manner by designating the location of the other conduit end (i.e. room name, junction box number, etc.). Indicate conduit length on the label.
16. For connections to equipment subject to movement, vibration, misalignment, cramped quarters, or noise transmission, use short length (maximum of 6ft) of the FMC or LFMC conduit. For installation in exterior locations, or humidity-laden atmosphere, corrosive atmosphere, water hose or spray wash down operations, and locations subject to seepage or dripping of oil, grease or water, use LFMC. Provide a green ground wire with FMC or LFMC conduit.
17. Terminations, Connections and Joints
    a. Securely connect conduits to boxes, cabinets, wireways, etc., using conduit connectors suitable for the application and one (or two) locknuts and, where required, an insulating bushing or insulated connectors. Torque threaded items to proper tightness.
    b. Where conduits are bonded to ground, securely attach grounding bushings and route bonding jumpers in as short of a path as possible to grounding point.
    c. Where joints and/or connections cannot be made tight, use a bonding jumper to maintain electrical continuity through the connection.
    d. Where terminations are subject to vibration, use a bonding bushing or wedge to maintain electrical continuity through the connection. Where subject to vibration or dampness, use insulating bushings to protect conductors.
    e. Vibration/Movement Isolation: At connections/terminations subject to vibration, movement, misalignment, and/or noise transmission, transition

duct bank conduit to a short length (maximum of 2-3 feet) of LFMC. Secure conduit to structure immediately prior to the transition.

C. Outlet Boxes / Back Boxes
   1. Install boxes plumb and square. Match heights of surrounding outlets (e.g., an adjacent electrical receptacle). Adjust locations and heights as required to suit coordination requirements of construction conditions.
   2. Install boxes flush with walls, ceilings and floors except where exposed work is called for on the drawings, required, or appropriate.
   3. Do not make unused openings in boxes (such as knocking out fabricated knock-outs without using the opening for a conduit connector). Replace boxes containing inadvertent or unused openings.
   4. Framed Walls, both Fire Rated and Non-Rated
      a. Install outlet boxes and covers/raised rings during rough-in such that the finished condition is flush with wall finishes.
      b. Do not install outlet boxes back-to-back (outlet boxes facing opposite sides of a wall). At framed walls not fire rated, install boxes with at least 6" separation. At fire rated framed walls, install boxes with at least 24" and 1 framing stud separation.
      c. Patch/repair openings in wall (plaster, drywall, and/or plasterboard) around boxes and/or raised rings to eliminate visible gaps after outlet gets finished, in accordance with CEC 314.21.
   5. Ceilings
      a. At ceilings, install boxes, supports (such as T-bar support bracket), and cover/ring such that the finished condition is flush with ceiling finishes, except where noted otherwise and where conditions prevent a flush installation
      b. At non-accessible ceilings, install service conduit continuous to an accessible location

D. Wall Boxes for Flat Panel Displays
   1. Install boxes plumb and square. Install boxes and covers/raised rings during rough-in such that the finished condition is flush with wall finishes. Patch openings around covers/raised rings to eliminate visible gaps after outlet gets finished.
   2. Confirm heights of each box. Coordinate with heights of associated services (e.g., electrical receptacle). Adjust locations and heights as required to coordinate with construction conditions.
   3. Do not make unused openings in boxes (such as knocking out fabricated knock-outs without using the opening for a conduit connector). Replace boxes containing inadvertent or unused openings.
   4. Do not install boxes back-to-back in a framed wall (boxes facing opposite sides of a wall), unless noted so on the drawings. At framed walls not fire rated, install boxes with at least 6" separation. At fire rated framed walls, install boxes with at least 24" and 1 framing stud separation.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.05 FINAL INSPECTION AND CERTIFICATION

A. Punch the Work of this Section compliant to the requirements of Section 27 00 00.

B. Comply with system acceptance and certification requirements of Section 27 00 00.

END OF SECTION 27 05 33

SECTION 27 05 36

COMMUNICATIONS BUILDING PATHWAYS – CABLE TRAYS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Cable tray systems as pathways within buildings to support low voltage systems.

B. Related Sections
   1. Comply with the Related Sections paragraph of Section 27 00 00.
   2. Section 27 05 26, "Communications Grounding and Bonding"
   3. Section 27 11 00, "Communications Rooms"

1.02 REFERENCES

A. Comply with the References requirements of Section 27 00 00.

B. In additional to those codes, standards, etc., listed in 27 00 00, products (including fabrication process) and installation shall comply with the latest edition of the following applicable specifications and standards:
   1. ASTM International
      a. ASTM A 123, "Specification for Zinc (Hot Galvanized) Coatings on Iron and Steel"
      b. ASTM A 510, "Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel"
      c. ASTM A 525, "General Requirements for Steel Sheet, Zinc-Coated Galvanized by the Hot-Dip Process"
      d. ASTM A 580, "Standard Specification for Stainless Steel Wire"
      e. ASTM A 591, "Specifications for Electrodepositing Coatings of Zinc on steel wire or sheets"
      f. ASTM A 641, "Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire"
      g. ASTM A 653, "Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process"
      h. ASTM B 633, "Specification for Electrodeposited Coatings of Zinc on Iron and Steel"
      i. ASTM D 769, "Standard Specification for Black Oxide Coatings"
      j. ASTM D3451, "Standard Guide for Testing Coating Powders and Powder Coatings"
   2. International Electrotechnical Commission (IEC)
      a. IEC 61537, "Cable Tray Systems and Cable Ladder Systems for Cable Management"

3. National Electrical Manufacturer Association (NEMA)
   a. NEMA VE 1 (also CAN/CSA C22.2 No. 126.1-09), "Metal Cable Tray Systems"
   b. NEMA VE 2, "Cable Tray Installation Guidelines"
4. National Fire Protection Agency (NFPA)
   a. NFPA 70B, "Recommended Practice for Electrical Equipment Maintenance"
   b. NFPA 70E, "Standard For Electrical Safety In The Workplace"
5. Underwriters Laboratories (UL)
   a. UL 467, "Grounding and Bonding Equipment"

1.03 DEFINITIONS

A. Definitions of Section 27 00 00 apply to this Section.

B. In addition to those Definitions of Section 27 00 00, the following list of terms as used in this Section defined as follows:
   1. "Cable Tray" and "Cable Tray System": A unit or assembly of units or sections and associated fittings forming a structural system used to securely fasten or support cables and raceways
   2. "Snake Tray": (manufactured by Cable Management Solutions) A welded steel wire cable conveyance system consisting of flexible linear or module sections designed to support. Where field formed bends are required, hand bend the linear sections in any direction along any plane without tools, cutting, clipping or modifications of the tray in order to complete the bend.
   3. "Wire Mesh Cable Tray": A cable support and management system fabricated of continuous, rigid, welded steel wire mesh; available in many sizes with attachment hardware suiting multiple installation methods; falls under NFPA 70's definition as cable tray

1.04 SYSTEM DESCRIPTION

A. Work Covered Under Other Sections:
   1. Backbone Conduits/Duct Banks: Conduits, supports, pull boxes, and pull strings
   2. Sleeves: Sleeves (pre-fabricated systems and/or EMT conduits) and supports

B. Wire Mesh Cable Tray Systems:
   1. Provide a complete cable tray system in accordance with CEC Article 392 and Article 250 (for Grounding and Bonding), NEMA VE 1, NEMA VE 2, manufacturer's instructions, and compliant to local inspections and seismic restraint requirements, UL listing requirements, NFPA 70E, NECA's "Standards of Installation" pertaining to general electrical installation practices, and recognized industry practices. Cable tray system shall conform to ANSI/TIA-569-B standard and BICSI TDMM guidelines. Complete shall include straight sections, connectors/splices, bonding straps, supports, etc., necessary for a complete installation. Routes shown on the Drawings are diagrammatic in nature. Field verify route prior to installation.

2. Supports: Provide supports at each connection point (junction of 2 or more straight sections), direction transitions, at the end of each run, and at other locations necessary to attain a fully supported and seismically braced cable tray system using a structurally-approved anchoring system and in accordance with NEMA VE 2.
    a. Allowable Support Methods:
        1) Trapeze (NEMA VE 2, Figure 4.1G)
        2) Single hanger clip (NEMA VE 2, Figure 4.2E)
        3) Wall cantilever (NEMA VE 2, Figures 4.7A and 4.7B)
        4) Wall vertical (NEMA VE 2, Figure 4.9D)
    b. Disallowable Support Methods:
        1) Center hung (NEMA VE 2, Figure 4.3A)
3. Seismic Bracing: Provide seismic bracing to supports and tray system. Seismic bracing shall be approved by a structural engineer licensed in the state of California.
4. Splices: Provide UL classified splice systems by the same manufacturer as the straight sections.
    a. Allowable Splice Methods: washer splice, splice plate, splice bar, wing splice (all splice methods shall be UL Classified)
5. Bend Radius: Cable tray system shall maintain a 12” (minimum) bend radius throughout.
6. Provide radius shields at each bend/corner of “T” type intersections and cross intersections.
7. Vertical Offsets: At vertical offsets 36 inch or less, provide a cable dropout on the higher level tray section. At vertical offsets greater than 36 inches, provide a section of tray installed vertically between the upper and lower tray levels.
8. Bonding and Grounding
    a. Cable tray shall be electrically continuous maintaining minimum metal area requirements per NFPA 70 Table 392.7 (for use as an equipment grounding conductor). Where straight sections or field fittings have been modified during installation such that wires have been removed, provide bonding straps or other approved accessories to maintain minimum continuous area per electrical code.
    b. Provide external bonding strap at connections, expansion joints, sleeves, crossovers, and at other locations where system continuity is interrupted.
    c. Bond cable tray system to approved ground, as per CEC Article 250, using approved connection means.
9. Dropouts:
    a. Provide dropouts as shown on the drawings.
    b. In locations that require 18” wide or 24” wide dropouts, combine one 12” wide dropout with one 6” wide dropout to create an 18” wide dropout, or two 12” wide dropouts to create a 24” wide dropout.
10. Provide blind ends where tray termination is exposed (e.g., not at a wall).

C. Clearances (minimum):
   1. Installation heights and clearances between cable tray and building structures: 12 inches (300 mm)
   2. Side and top access clearance: 12 inches (300 mm)
   3. From fluorescent light fixtures, or other EMI sources: 6 inches (150 mm)
   4. From any motor, transformer: 48 inches (1,220mm)
   5. From flue, hot water, steam line or other non-insulated heat sources: 12 inches (300 mm)

D. Penetrations:
   1. Penetrate partitions and other construction assemblies, including fire rated assemblies, smoke barriers, smoke partitions, acoustic rated assemblies, etc., using approved methods.
   2. When penetrating concrete walls (including shear walls) and/or floors, scan the area to be penetrated and core openings using methods approved by the structural engineer and by the AHJ. Obtain written approval for locations and means when not using methods included in the contract documents.
   3. When penetrating fire rated assemblies, provide UL Classified and FM Approved fire rated systems in accordance with ASTM E814 (UL1479). Provide solid bottom type cable tray with a solid cover extending 24 inches from the finished surface of the wall on both sides. Provide labels at both sides of the penetration. Refer to drawings for approved systems per application.
   4. When penetrating acoustic rated assemblies, provide solid bottom type cable tray with a solid cover extending 18 inches from the finished surface of the wall on both sides. Provide sealant to fill gaps, cavities, etc, to fully seal penetration.

1.05 SUBMITTALS

A. General: Conform to Submittal requirements as described in Section 27 00 00.

B. Quantity: Furnish quantities of each submittal as noted in Section 27 00 00.

C. Submittal Requirements Prior to the Start of Construction:
   1. Product Data: Submit product data showing manufacturers, part numbers, dimensions, fabrications materials, fabrication details, finishes, capacities, and accessories; also include certifications (factory-certified test reports of specified products, complying with IEC 61537, CECand NEMA VE 1)
      a. Submittal should include manufacturer's certification indicating ISO 9001 quality certified
   2. Shop Drawings: Submit shop drawings consisting of the following:
      a. Cable tray layout/routes, supports locations, support details
      b. Highlight proposed changes to pathways (routes, types, sizes, etc.) compared to the contract documents
      c. Clearance variations and/or requests for exceptions
      d. Seismic bracing details (also see “Seismic Calculations” below)

e. Instances of penetrations through fire and smoke rated barriers, including calling out firestopping type/UL System, size, quantity, and other relevant information

3. Seismic Calculations: Submit seismic calculations for support systems in conformance Section 27 00 00. Structural Calculations shall be prepared and signed by a California Registered Structural Engineer. If used, specify proof loads for drilled-in anchors.

D. Submittal Requirements at Close Out:
1. As-Built Drawings, showing the routes, dimensions, types, sizes, quantities, etc. (minimum)
2. O&M Manual, including as-builts, parts list, repair information, and maintenance requirements

E. Substitutions
1. Requests for substitutions shall conform to the general requirements and procedure outlined in Section 27 00 00.

1.06 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of section 27 00 00.

B. Manufacturer shall make available test reports witnessed by an independent testing laboratory of the "worst case" loading conditions and performed in accordance with the latest revision of NEMA VE 1

C. Materials and installation shall comply with CEC – construction and installation of cable tray and cable channel systems per Article 318, bonding per Article 250, and other articles as applicable per instance.

D. Installation shall comply with NFPA 70B, "Recommended Practice for Electrical Equipment Maintenance".

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of section 27 00 00.

1.08 WARRANTY

A. Comply with Warranty requirements of section 27 00 00.

PART 2 - PRODUCTS

2.01 CABLE TRAY – WIRE MESH TYPE

A. Application: Suitable for the support and management of communications cables, overhead.

B. Tray shall be manufactured in accordance with NEMA VE1.

C. Material: Straight sections shall be fabricated from high strength steel wires and formed into a 2-inch by 2-inch (or 2-inch by 4-inch) wire mesh pattern with welded wire intersections. Wires shall meet the minimum mechanical properties of ASTM A510 Longitudinal wires shall be straight (with no bends). Wires diameter should be approximately 0.16" (4mm). Wire ends shall be rounded during manufacturing (for safety of cables and installers) or T-welded to the top wire along sides (flanges).

D. Finish: Electro-plate SC2 yellow zinc chromate, in accordance with ASTM B633.

E. Splicing assemblies shall be the bolted-type using serrated flange locknuts. Hardware shall have yellow zinc chromate finish, in accordance with ASTM B63.

F. Size: Refer to Drawings for sizes.

G. Manufacturers:
1. Chatsworth Products "OnTrac" series wire mesh cable tray
2. Cooper B-Line "Flextray" series wire mesh cable tray
3. Legrand Cablofil wire mesh cable tray
4. Mono-Systems "Mono-Mesh" wire mesh cable tray
5. WBT
6. Or equal

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with the Execution requirements of Section 27 00 00.

B. Install cable tray systems in accordance with manufacturers' instructions, with NEMA VE2 and with recognized industry practices, Install cable tray systems compliant to requirements of CEC, applicable portions of NFPA 70B, and to NECA's "Standards of Installation" pertaining to general electrical installation practices.

3.02 PREPARATION

A. Plan routes and locations of pathway systems and coordinate with other trades/systems (ductwork, plumbing, electrical raceways, wall construction, ceilings, etc.). Pathway systems shall not unnecessarily cross other trade's work, shall not prevent removal of ceiling tiles or panels, and shall not block access to mechanical or electrical equipment. Provide offsets as required to avoid obstruction of pathway systems with other trades.

B. Prior to installation, examine areas to receive pathways systems to verify conditions are ready for work and to verify conformance with manufacturer and specification tolerances. Notify the County's Representative in writing of conditions that would

adversely affect the installation, or subsequent utilization, of the system. Proceed with installation when unsatisfactory conditions are corrected.

3.03 INSTALLATION

A. Supports (for trapeze, for example) may be shared with other trades/building systems to improve overall construction cost efficiencies. Attach supports to the exterior of the cable tray. Do not install brackets, rods, etc., through the inside of the cable tray

B. Ensure no other trades/building systems conflict with cable tray systems and clearances. Other building infrastructure, such as columns, pipes, valves, etc., shall not route inside or through cable tray. Either relocate/alter other building infrastructure (preferred) or, if other building infrastructure cannot be altered, adjust the cable tray route to avoid conflicts other building infrastructure.

C. Install cable trays parallel or at right angles to the centerlines of columns and beams.

D. Round edges and smooth surfaces to eliminate sharp edges and spurs that could damage (cut, puncture, etc) cable jackets.

E. Thoroughly clean surfaces receiving connections for bonding.

F. Clearances: Ensure clearance and access requirements to cable tray – above, below, and side – as shown on the drawings are met. Coordinate with other trades to avoid other building infrastructure encroaching on access/clearance.

G. Fabricate fittings (tee, cross, reducers, and 90-degree turns) in the field according to the manufacturer's instructions and to ensure the pathway system remains UL listed. Fabricate fittings by cutting wires with a cutting device approved by the manufacturer. Cut wires in a manner that minimizes sharp edges and projections to prevent damage to cables (such as cut outer jacket) or harm to installation personnel. Provide corner connectors that provide a radius on the inside corner of bends for horizontal 90 degree bends, tees, and crosses. Bends shall have a minimum of a 12-inch bend radius.

H. At transition to and/or interface with conduit, align end of cable tray directly underneath the conduits.

I. Bonding and Grounding
   1. Bond system per "System Description" requirements.
   2. For aluminum cable tray, apply anti-oxidant compound to tray surface before contact with bonding accessories.

J. Protection: Protect installed system until completion of project. Touch-up, repair or replace damaged products before punch walk.

3.04 PRE-FUNCTIONAL TESTING

A. After installing cable tray systems, perform the following pre-functional testing.

B. Visually inspect the completed cable tray system for intrusion of items such as pipe, hangers, or other equipment. If found, notify Engineer (explain in detail the conflict and suggest means to eliminate the conflict). Adjust cable tray as approved to eliminate spatial conflict and to ensure clearance.

C. Visually inspect the completed cable tray system for mechanical continuity at each cable tray joint, fitting, junction, attachment to supports (e.g., hold-down clips), etc. Check the hardware for missing or damaged bolts, bolt heads, or nuts – if found, replace with specified hardware. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.

D. Visually inspect seismic bracing. Ensure each instance complies with approved methods and is complete (anchors, stiffeners, hardware, etc). Check the hardware for missing or damaged bolts, bolt heads, or nuts – if found, replace with specified hardware. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.

E. Visually inspect the barriers to ensure they have been installed per dimensions specified

F. Visually inspect the cover to ensure they have been installed as require

G. Visually inspect the completed cable tray system for vibration. If excessive vibration is found, provide vibration isolation apparatus as needed to eliminate vibration.

H. Visually inspect the completed cable tray system for thermal expansion and contraction conditions. If thermal expansion is identified, provide expansion fittings and other apparatus necessary to eliminate (or mitigate) expansion (and/or contraction).

I. Visually inspect the completed cable tray system for electrical continuity at each cable tray joint and each ground connection. Ensure adequacy of cable tray grounding. Verify that takeoff raceways are bonded to cable tray.

J. Visually inspect the completed cable tray system for sharp edges and corners. If found, grind or file edges and corners to smooth.

K. Visually inspect the completed cable tray system for deflections and protuberances; correct any not within specifications

L. Clean cable tray system: Remove deposits of dust, scrap materials, trash of any description, and any blockage of tray ventilation.

M. Record results of visual inspections. Submit pre-functional report to Engineer.

3.05 TESTING

A. Test cable tray systems in accordance with NFPA 70B Chapter 21 for electrical continuity and connection to approved ground. Measure ground resistance; verify cable tray is bonded to approved ground with a total resistance less than 5 ohms. Adjust bonding as needed to meet this requirement.

3.06 PROTECTION

A. Protect installed products until completion of project.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
   2. Repair damage to paint finishes with matching touchup coating recommended by cable tray manufacturer.
   3. Install temporary protection for cables in open trays to protect exposed cables from falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials until the risk of damage is over.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.07 FINAL INSPECTION AND CERTIFICATION

A. Punch the work of this section compliant to the requirements of Section 27 00 00.

B. Comply with system acceptance and certification requirements of Section 27 00 00.

END OF SECTION 27 05 36

SECTION 27 08 11

COMMUNICATIONS TWISTED PAIR TESTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Testing of Communications Twisted Pair Cabling (both Backbone and Horizontal Cabling subsystems).

B. Related Sections
   1. Comply with the Related Sections paragraph of Section 27 00 00.
   2. Section 27 13 13 - Communications Backbone ISP Twisted Pair Cabling
   3. Section 27 15 13 - Communications Horizontal Twisted Pair Cabling

1.02 REFERENCES

A. Comply with the References requirements of Section 27 00 00.

B. In addition to the References of Section 27 00 00, the following references apply to this specification:
   1. ANSI/TIA-1152, “Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling”

1.03 DEFINITIONS

A. Refer to Definitions of Section 27 00 00, Section 27 13 13 and Section 27 15 13.

B. In addition to those Definitions of Section 27 00 00, the following list of terms as used in this specification defined as follows:
   1. “CAT3”: Shall mean Category 3 cabling, per ANSI/TIA-568-C.2
   2. “CAT6A”: Shall mean Augmented Category 6 cabling, per ANSI/TIA-568-C.2
   3. “Channel”: Shall mean a testing configuration which includes the Permanent Link and the line cord (at the workstation), the equipment cord, and, if a full crossconnection is implemented, a patch cord and the crossconnect termination/connecting apparatus.
   4. “Connect”: Shall mean install all required patch cords, equipment cords, cross-connect wire, etc. to complete an electrical or optical circuit.
   5. “Cord”: Shall mean a length of cordage having connectors at each end. The term “Cord” is synonymous with the term “Jumper” and “Lead”.
   6. “Permanent Link”: Shall mean the ‘permanent’ portion of the Horizontal cabling to each outlet with the test cords de-embedded from the measurements; this includes cable, consolidation point (if used), termination/connecting apparatus in the IDF and the connector at the outlet.
   7. “System Cord”: Shall mean the cord used in the operating transmission circuit.

8. "Test Cord": Shall mean the cord certified for use in testing, as described in this section.

1.04 SYSTEM DESCRIPTION

A. Refer to Section 27 00 00, Section 27 13 13 and Section 27 15 13 for additional system description information.

B. Work Provided Under Other Sections
   1. Backbone twisted pair cabling
   2. Horizontal twisted pair cabling

C. Base Bid Work
   1. Testing of a completed communication infrastructure cabling system, which includes:
      a. Submittals
      b. Testing of the twisted pair cabling as follows:

Table 270811-1.1: Tests For UTP Cabling

Subsystem	Type	Test	Configuration	Notes
Backbone	ISP/Riser	*see "Notes"	-	Wire map & length
Horizontal	CAT6A	Category 6A	Permanent Link	Per TIA-568-C.2, 6.3

      c. Record Documents, including test results.

1.05 SUBMITTALS

A. Comply with the Submittal requirements of Section 27 00 00.

B. Submittal Requirements at Start Of Construction:
   1. Testing Procedures Submittal, describing step-by-step procedures used by the field technicians.
   2. Product Submittal, including cut sheets of testing equipment to be used (note all software/ firmware versions as applicable).
   3. Schedule Submittal, consisting of proposed schedule of work. This schedule may be combined with the schedule developed for Division 27.

C. Submittal Requirements at Closeout:
   1. Record Documents:
      a. Submit one hard copy and one soft copy of test reports, including all tested parameters. . This may be combined with the reports of Section 27 08 21.
      b. Submit one hard copy of warranty certificate.
   2. Format – Hard Copy:
      a. Prints of test reports, on 8.5"x 11" paper, color or black & white, one cabling link per page
      b. Assemble prints into a 3-ring binder

c. Clearly label the cover of each test reports binder with the following information:
   1) Client Name
   2) Project Name and Address
   3) Binder Name (e.g., "Test Reports for Horizontal Cabling System")
   4) Date of Submittal – date format: <month> <day>, <year> (e.g., "January 1, 2012")
   5) Contractor Name
d. Include a Table Of Contents at the beginning that lists the contents
e. Organize the test reports by Backbone Cabling / Horizontal Cabling, by building, by floor, and by IDF.
f. Sort reports in ascending cable ID order
g. Include tabbed separators for improved navigation through the manual

3. Format – Soft Copy:
   a. "Burn" onto one CD-ROM test report files as native data format (for example, an *.FLW file from a Fluke tester); if not possible to submit in native format, then issue test results as an exported Microsoft Excel compatible format.
   b. Include onto CD-ROM 'Viewer' software necessary to view, sort, filter, and print individual and summary test results from test results native format.
   c. Clearly label the CD-ROM with the following information:
      1) Client Name
      2) Project Name and Address
      3) CD-ROM Name (e.g., "Test Reports for Horizontal Cabling System")
      4) Date of Submittal – date format: <month> <day>, <year> (e.g., "January 1, 2012")
      5) Contractor Name

1.06 QUALITY ASSURANCE

A. Comply with the Quality Assurance requirements of Section 27 00 00.

B. Under no circumstances shall any cable's and/or conductor's test results be substituted for another's. If an instance of falsification is confirmed, the Contractor is liable for a complete retest of the cabling system at no additional cost to the County. This includes the retaining the services of a neutral party to observe all retesting.

1.07 WARRANTY

A. Warrant the validity of the test results.

PART 2 - PRODUCTS

2.01 BACKBONE TWISTED PAIR CABLING TESTER

A. Areas of Test Measurement (minimum): Wire Map (continuity, opens, shorts, crossed pairs, split pairs): Siemon #MT-5000 test unit, with 25-pair adapter, or equal.

2.02 CATEGORY 6A HORIZONTAL CABLE TESTER

A. Equipment shall be independently verified to meet ANSI/TIA-1152 requirements, including Level IIIe minimum accuracy. Equipment shall meet ISO/IEC Class C, D, E, and F.

B. Test Standards (minimum): ANSI/TIA-568-C.2 Category 6A; ISO/IEC 11801 Class C and D; ISO/IEC 11801-2000 Class C and D, 1000Base-T, 100Base-TX; IEEE 802.3 10Base-T; ANSI TP-PMD; IEEE 802.5

C. Areas of Test Measurement (minimum): test areas listed under ANSI/TIA568-C.2, 6.3

D. Equipment:
   1. Fluke Networks
      a. #DTX-1800; "CableAnalyzer" test kit (main unit, remote unit, CAT6A permanent link adapters, CAT6A channel adapters, accessories), loaded with the latest firmware version.
      b. "LinkWare" reporting and latest version of documentation software

PART 3 - EXECUTION

3.01 SCHEDULING

A. Prepare a construction schedule based on the schedule developed in sections 271513 and 271523 for the testing activities. Update testing schedule when changes in the cabling schedules occur.

3.02 FIELD QUALITY CONTROL

A. Calibrate test sets and associated equipment per the manufacturers printed instructions at the beginning of each day's testing and after each battery charge. Fully charge the test sets prior to each day's testing to ensure proper operation.

B. Ensure test equipment and test cords are clean and undamaged during testing activities. Per the Engineer's discretion, halt testing activity and clean testing equipment, test cords, and related apparatus.

3.03 BACKBONE TWISTED PAIR CABLING TESTING REQUIREMENTS AND PROCEDURES

A. Precautions
   1. Adhere to the equipment manufacturer's instructions during all testing.
   2. Prior to any testing activity or any measurements taken, ensure the test equipment is at room temperature – approximately 70 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set for about 15 minutes or for however long it takes to bring the test equipment to reach room temp).

3. Fully charge power sources before each day's testing activity

B. Testing Requirements
   1. Test backbone multipair cabling per "Base Bid Requirements" in Part 1 of this Section.
   2. The installation will be accepted when testing has indicated availability of 100% terminated pairs.

C. Testing Procedures
   1. Test continuity and wire map for all pairs.
   2. Test length for 2% of pairs of each cable. Pairs shall be from different 25-pair binder groups.

D. Acceptable Test Result Measurements
   1. Overall:
      a. Links which report a Fail, Fail* or Pass* for any of the individual tests shall result in an overall link Fail. All individual test results must result in a Pass to achieve an overall Pass.
      b. Any reconfiguration of a link components required as a result of a test Fail, must be re-tested for conformance.
      c. Remove and replace any cabling links failing to meet the criteria described in this specification, at no cost to the County, with cables that prove, in testing, to meet the minimum requirements.
   2. Length
   3. Wire Map: Provide continuous cable link and terminate all pairs correctly at both ends. No exceptions accepted.
   4. Attenuation: The acceptable attenuation measurements for any CAT3 cabling link is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3 and as adjusted to length measurement.
   5. Worst Pair-to-Pair Near End CrossTalk (NEXT) Loss: The acceptable worst pair-to-pair NEXT loss no greater than that listed in ANSI/EIA-568-C.2, 6.3 for CAT3 cabling.

E. Record Documents:
   1. Permanently record test results.
   2. Cable and pair identifiers of the test reports shall match the identifiers as labeled in the field – i.e., use the same ID on the cable label/termination label as what appears on the test reports.
   3. Measurements shall carry a precision through no significant decimal place.
   4. Each test report shall contain the following information (not necessarily in this order):
      a. Project name
      b. Cable identifier, pair number(s)
      c. Date measurement were obtained
      d. Operator (company and name)
      e. Test equipment model and serial number(s)

f. Measurement results

3.04 HORIZONTAL CATEGORY 6A TESTING PROCEDURES

A. Precautions
1. Adhere to the equipment manufacturer's instructions during all testing.
2. Prior to any testing activity or any measurements taken, ensure the test equipment is at room temperature – approximately 70 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set for about 15 minutes or for however long it takes to bring the test equipment to reach room temp).
3. Fully charge power sources before each day's testing activity

B. Test Equipment Set Up
1. Set up the tester to perform a full CAT6A test, as a Permanent Link configuration.
2. If the tester has cable-specific test parameters pre-loaded, set up the tester as product-specific setting. If not, set as generic CAT6A.
3. Set the tester to save the full test results (all test points, graphs, etc.).
4. Save the test results with the associated cable link identifier.
5. Calibrate the test set per the manufacturer's instructions.

C. Acceptable Test Result Measurements
1. Overall Test Results:
   a. The County shall accept only individual test results that result in a Pass.
   b. Links which report a Fail, Fail* or Pass* for any of the individual tests shall result in an overall link Fail.
   c. Any reconfiguration of link components required as a result of a test Fail, must be re-tested for conformance.
   d. Remove and replace any cabling links failing to meet the criteria described in this specification, at no cost to the County, with cables that prove, in testing, to meet the minimum requirements.
2. Wire Map: Correctly terminate all pairs of the cabling link at both ends. Provide only continuous pairs. No exceptions.
3. Length: Ninety-four meters is the maximum acceptable electrical length measurements for any cabling link measured under a Permanent Link configuration, including test cords.
4. Insertion Loss: The acceptable insertion loss measurements for any CAT6A cabling link is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.
5. Worst Pair-to-Pair Near End CrossTalk (NEXT) Loss: The acceptable worst pair-to-pair NEXT loss for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.
6. Power Sum NEXT Loss: The acceptable power sum PS-NEXT loss for any CAT6A cable is that which is no greater than that as listed in ANSI/EIA-568-C.2, 6.3.
7. Worst Pair-to-Pair ELFEXT and FEXT Loss: The acceptable worst pair-to-pair ELFEXT and loss for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

8. Power Sum ELFEXT and FEXT Loss: The acceptable PS-ELFEXT and loss for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.
9. Alien Near End CrossTalk (ANEXT) Loss: The acceptable ANEXT loss for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.
10. Alien Far End CrossTalk (AFEXT) Loss: The acceptable AFEXT loss for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.
11. Return Loss: The acceptable return loss measurements for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.
12. Propagation Delay and Delay Skew: The acceptable propagation delay and delay skew measurements for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

D. Record Documents:
   1. Permanently record test results.
   2. Export all of the numerical test results to a single spreadsheet in Microsoft Excel® 2003 (*.xls) or 2007 (*.xlsx) file format.
   3. Submit test results at the conclusion of the testing to the Engineer for approval. Engineer will check these test reports for a format acceptable to the County, or County's Representative.
   4. For each Horizontal CAT6A test, record the following information:
      a. Project name and address
      b. Testing Company's and Operator's name
      c. Date of measurement
      d. Test equipment, including the following:
         1) Manufacturer, model, and serial number
         2) Date and time of last calibration
      e. Identification number of cable
      f. Overall test result

END OF SECTION 27 08 11

SECTION 27 08 21

COMMUNICATIONS FIBER OPTIC TESTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Testing of Telecommunications Backbone Fiber Optic Cabling.

B. Related Sections
   1. Comply with the Related Sections paragraph of Section 27 00 00.
   2. Section 27 13 23 - Communications Backbone ISP Fiber Optic Cabling

1.02 REFERENCES

A. Comply with the References requirements of Section 27 00 00.

B. In addition, the following standards are referenced to this Section:
   1. TIA/EIA-526-14A (OFSTP-14), "Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant"
   2. TIA/EIA-526-7 (OFSTP-7), "Measurement of Optical Power Loss of Installed Singlemode Fiber Cable Plant"
   3. EIA/TIA-455-77 (FOTP-77), "Procedures To Qualify A Higher-Order Mode Filter For Measurements On Singlemode Fibers"
   4. EIA/TIA-455-78A (FOTP-78), "Spectral-Attenuation Cutback Measurement for Singlemode Optical Fibers"
   5. EIA-455-95 (FOTP-95), "Absolute Optical Power Test for Optical Fibers and Cables"
   6. EIA-455-171 (FOTP-171), "Attenuation By Substitution Measurement – For Short-Length Multimode Graded-Index And Single-Mode Optical Fiber Cable Assemblies"
   7. American National Standards Institute (ANSI) Z136.2, "American National Standard for the safe use of optical fiber communication systems utilizing laser diode and LED sources"
   8. BICSI Telecommunication Distribution Methods Manual (TDMM)

1.03 DEFINITIONS

A. Refer to Definitions of Section 27 00 00 and Section 27 13 23.

B. In addition to those Definitions of Section 27 00 00, the following list of terms as used in this specification defined as follows:
   1. "Adapter" (associated with fiber connectivity): Shall mean a connecting device that joins 2 fiber connectors, either like or unlike
   2. "Connect": Shall mean install all required test cords, patch cords, system cords, etc. to complete an optical circuit

3. "CPR": Coupled Power Ratio (according to TIA/EIA-526-14A Annex A
4. "Cord": Shall mean a length of cordage having connectors at each end; the term "Cord" is synonymous with the term "Jumper"
5. "Jumper": See "Cord"
6. "OTDR": Shall mean Optical Time Domain Reflectometer
7. "Passive Link Segment": Shall mean the cable, connectors, couplings, and splices between two fiber optic termination units
8. "System Cord": Shall mean the cord used in the operating electrical or optical circuit.
9. "Test Cord": Shall mean the cord certified for use in testing, as described in this section

1.04 SYSTEM DESCRIPTION

A. Refer to Section 27 00 00 and Section 27 13 23 for addition system description information.

B. Work Provided Under Other Sections
   1. Backbone fiber optic cabling

C. Base Bid Work
   1. Submittals: pre-testing and post-testing
   2. Testing of completed fiber optic passive link segment(s) per the following table:

Table 270821-1.1: Tests For Fiber Optic Cabling

Subsystem	Type	Test	Direction	Wavelength
Backbone	Multimode	Optical Power Loss	Both	850nm and 1300nm
Backbone	Singlemode	Optical Power Loss	Both	1310nm and 1550nm

   3. Record Documents, including test results

1.05 SUBMITTALS

A. Comply with the Submittal requirements of Section 27 00 00.

B. Submittal Requirements at Start Of Construction:
   1. Testing Procedures Submittal: Describe step-by-step procedures used by the field technicians.
   2. Pre-Testing Loss Calculations Submittal: Calculate the loss of each segment. The cable length may be based on the footage markings printed on the cable jacket. Include a brief description of each segment.
   3. Product Submittal, including cut sheets of testing equipment and the following information (*this data must match the test reports*):
      a. Manufacturer and model number
      b. Serial number

c. Date of last factory calibration
d. Software/ firmware versions (as applicable)

4. Schedule Submittal, consisting of proposed schedule of work (this schedule may be combined with the schedule developed for Division 27)

C. Submittal Requirements at Closeout:
1. Submit test results and reports in a format acceptable to the County, or County's Representative, or Engineer before system acceptance.
2. Submit one soft copy and one hard copy of test reports, including all tested parameters. This may be combined with the reports of Section 27 08 11.
3. Submit one hard copy of warranty certificate from the manufacturer and the Contractor
4. Each test report (per strand per cable link) shall include the following information:
   a. Project/Client name, and project address
   b. Date of test
   c. Contractor (Company) and Technician's name
   d. Test equipment, including Serial Numbers (*must match pre-testing submittal*)
   e. Test procedure (e.g., OFSTP-14A) and method (e.g., Method B)
   f. Light source's launch category (including CPR) and spectral width
   g. Wavelength
   h. Cable identifier, fiber number, and fiber type (e.g., "multimode")
   i. Measurement direction, including end locations
   j. Optical loss measurement
5. Cable and fiber identifiers of the test reports shall match the identifiers as labeled in the field – i.e., the ID stored with the test result shall be the same ID as on the cable label/fiber port label.
6. Format – Soft Copy:
   a. "Burn" onto one CD-ROM test report files as native data format (for example, an *.FLW file from a Fluke tester).
   b. Include onto CD-ROM (or separate CD-ROM) 'Viewer' software necessary to view, sort, filter, and print individual and summary test results from test results native format.
   c. Clearly label the CD-ROM with the following information:
      1) County Name
      2) Project Name and Address
      3) CD-ROM Name (e.g., "Test Reports for Backbone Cabling System")
      4) Date of Submittal – date format: <month> <day>, <year> (e.g., "January 1, 2010")
      5) Contractor Name
7. Format – Hard Copy of Optical Loss Testing:
   a. Prints of test reports, on 8.5"x 11" paper, color or black & white, one cabling link per page
   b. Assemble prints into a 3-ring binder

c. Clearly label the cover of each test reports binder with the following information:
   1) County Name
   2) Project Name and Address
   3) Binder Name (e.g., "Test Reports for Backbone Cabling System")
   4) Date of Submittal – date format: <month> <day>, <year> (e.g., "January 1, 2010")
   5) Contractor Name
d. Include a Table Of Contents at the beginning that lists the contents
e. Organize the test reports by Backbone Cabling / Horizontal Cabling, by building, by floor, and by IDF.
f. Sort reports in ascending cable ID order
g. Include tabbed separators for improved navigation through the manual

8. Format – Hard Copy of Characterization:
   a. Use feet for the units for distance measurements (i.e., the "X" axis of the graph) shown on the print of the test measurements.
   b. Print reports such that strands of a given cabling link have matching axis scales; the x-axis shall be the same report-to-report and as well as the y-axis shall match report-to-report.
   c. The trace of the printed test report shall show the launch cord.
   d. Each test report shall contain the following information (not necessarily in this order):
      1) County Name
      2) Project Name and Address
      3) Cable identifier, fiber/strand number, and fiber type (e.g., "multimode")
      4) Operator (company and name)
      5) Date measurements were obtained
      6) Measurement direction
      7) Set up parameters (such as wavelength, pulse width, refractive index, event threshold)
      8) Test equipment model and serial number(s)
      9) OTDR trace
      10) Length of fiber
      11) Overall link loss
      12) Contractor Name
   e. For each cabling link, include either a schematic graphic or a brief narrative accurately describing the test set up. The description shall include test/launch cord (with length), expected events (connectors, slices, etc.) with expected distances, etc. This information will eliminate many questions the Engineer will have while reviewing the reports.

1.06 QUALITY ASSURANCE

A. Comply with the Quality Assurance requirements of Section 27 00 00.

B. Testing equipment shall be fully functional and in proper working order. Testing equipment shall be factory calibrated within the manufacturer's published calibration period. Testing equipment must have loaded the latest firmware / operating software.

C. Under no circumstances shall any cable's and/or optical conductor's test results be substituted for another's. If an instance of falsification is confirmed, the Contractor will be liable for a complete retest of the cabling system at no additional cost to the County. This includes the retaining the services of a neutral party to observe all retesting.

1.07 WARRANTY

A. Warrant the validity of the test results. Issue such warranty in writing.

PART 2 - PRODUCTS

2.01 FIBER OPTIC LIGHT SOURCE

A. Light source used for testing multimode fibers shall confirm to TIA/EIA-526-14A, 3.1. Light source used for testing singlemode fibers shall confirm to TIA-526-7, 3.1.1.

B. Light source's modal launch condition shall be Category 1.

C. Light source's connection interfaces shall be factory installed. Field-configurable connection interface will not be allowed.

D. Light source's output wavelength and power shall be constant/unchanged after setting.

E. Light source shall be factory calibrated (date of last factory calibration must be documented).

F. Equipment:
   1. Corning Cable Systems
      a. #OS-403RD; dual wavelength (850 / 1300) light source for multimode
      b. #OS-404RXD; dual wavelength (1310 / 1550) light source for singlemode
   2. Exfo
      a. #FOT-930; OLTS test set
      b. #FOT-600 OLTS test set (#23BL Source + #602X Meter)
      c. #FOT-300; OLTS test set
   3. Fluke Networks
      a. #DTX-1800; "DTX CAbleAnalyze" Test Kit – or bundled kit
      b. #DTX-MFM2 Fiber Module, for Multimode Fiber
      c. #DTX-GFM2 Gigabit Fiber Module, for Multimode Fiber
      d. #DTX-SFM2 Fiber Module, for Singlemode Fiber
      e. "SimpliFiber" Test Kit

2.02 FIBER OPTIC POWER METER

A. Power meters used for testing multimode fibers shall conform to TIA/EIA-526-14A, 3.2. Power meters used for testing singlemode fibers shall conform to TIA/EIA-526-7, 3.1.2.

B. Power meter shall be capable of measuring both relative and absolute power, and shall feature data storage (of measurements).

C. Power meter used shall have the following performance:
   1. Dynamic range of 0dBm to -50dBm, minimum
   2. Accuracy of ±0.2dB

D. Power meter shall be factory calibrated (date of last factory calibration must be documented).

E. Equipment:
   1. Corning Cable Systems
      a. #OTS-610; power meter with data storage
      b. #OTS-400 series power meter (legacy product series)
   2. Exfo
      a. #FOT-930; OLTS test set
      b. #FOT-600 OLTS test set (#23BL Source + #602X Meter)
      c. #FOT-300; OLTS test set
   3. Fluke Networks
      a. #DTX-1800; "DTX CableAnalyze" Test Kit – or bundled kit
      b. #DTX-MFM2 Fiber Module, for Multimode Fiber
      c. #DTX-GFM2 Gigabit Fiber Module, for Multimode Fiber
      d. #DTX-SFM2 Fiber Module, for Singlemode Fiber
      e. "SimpliFiber" Test Kit

2.03 FIBER OPTIC MANDREL

A. For 50/125 μm fiber: 22 mm mandrel diameter for jacketed (3.0 mm) fiber.

B. Equipment:
   1. Fluke Networks
      a. #NF-MANDREL-50; red mandrel for jacketed 50/125 um fiber

2.04 FIBER OPTIC OTDR

A. Multimode Source Module:

Wavelength	Dynamic Range	Attenuation Deadzone	Reflective Deadzone	Loss Resolution	Distance Accuracy
850nm	24dB	6.5mt	3.0mt	0.001dB	0.1mt
1300nm	27dB	7.0mt	3.0mt	0.001dB	0.1mt

B. Singlemode Source Module:

Wavelength	Dynamic Range	Attenuation Deadzone	Reflective Deadzone	Loss Resolution	Distance Accuracy
1310nm	40dB	6.0mt	3.5mt	0.001dB	0.1mt
1550nm	28dB	12.0mt	3.5mt	0.001dB	0.1mt

C. Equipment:
1. Corning Cable Systems
   a. #OV-1000; OTDR 'mainframe'
   b. #400-MD26; multimode module for OV-1000 OTDR
   c. #400-SD34; singlemode module for OV-1000 OTDR
   d. #2001HR; for multimode & singlemode systems (legacy product series)
   e. #340 OTDR Plus Multitester II (legacy product series)
   f. #MiniOTDR+; for multimode & singlemode systems (legacy product series)
2. Exfo
   a. #FTB-500 platform OTDR
   b. #FTB-200 platform compact OTDR
3. Fluke Networks
   a. #OF-500; "OptiFiber" OTDR mainframe – or bundled kit
   b. #OFTM-5610B; Multimode module for OptiFiber OTDR
   c. #OFTM-5730; Singlemode module for OptiFiber OTDR
   d. #OFTM-5610B; Multimode module for OptiFiber OTDR

D. Reader Software: Windows-based software capable of reading stored traces and is fully functional with the testing equipment.

2.05 FIBER OPTIC TEST CORDS

A. Multimode Fiber Optic Test Cord
1. Multimode test cords shall conform to TIA-526-14A, 3.3.
2. The fiber of the multimode test cord(s) shall have the core diameter to that of the multimode fiber optic passive link under test.
3. Connectors of the test cords shall be compatible with (the same type as) the connector types of the light source and the power meter, and with the cabling plant.
4. The connectors shall exhibit ≤ 0.5dB loss per connection @ both 850nm and 1300nm, as measured per FOTP-171 D2.
5. Test cord length for Optical Power Loss testing: 1m - 5m.

B. Singlemode Fiber Optic Test Cord
1. Singlemode test cords shall comply to 526-14A, 3.1.3.
2. The fiber of the singlemode test cord(s) shall have the mode field diameter nominally equal to that of the singlemode fiber optic passive link.
3. Connectors of the test cords shall be compatible (the same type) with the connector types of the light source and the power meter, and with the cabling plant.

4. The connectors shall exhibit ≤ 0.5dB loss per connection @ both 1310nm and 1550nm, as measured per FOTP-171 D3. The connectors shall inhibit Fresnel reflections (i.e., have a "PC" finish).
5. Test cord length for Optical Power Loss testing: 1m - 5m.

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

A. Prior to the start of testing, set up a meeting with the Engineer to witness testing procedures. The Engineer will, at their discretion, come to the site and witness the technician's actual testing procedures. The Engineer may give verbal comments to correct the technician's procedures to meet these requirements, followed up with a written observation report.

B. Calibrate test sets and associated equipment per the manufacturers printed instructions at the beginning of each day's testing and after each battery charge. Fully charge the test sets prior to each day's testing to ensure proper operation.

C. Use undamaged test equipment and test cords. Clean connectors and adapters (with a lint-free wipe and 90% (or higher) isopropyl alcohol) prior to and during testing activities. Per the Engineer's discretion, halt testing activity and clean testing equipment, test cords, and related apparatus.

D. Permanently record test results.

3.02 OPTICAL POWER LOSS TESTING REQUIREMENTS AND PROCEDURES

A. Safety: Use test equipment containing a laser or LED in accordance with ANSI Z136.2.

B. Test fiber optic passive links per "Base Bid Work" under System Description in Part 1 of this Section. Follow the procedures in the following order.

C. Precautions
   1. Adhere to the precautions described in TIA-526-14A, 5.1.
   2. Adhere to the equipment manufacturer's instructions during all testing.
   3. Prior to any testing activity or any measurements taken:
      a. Ensure test equipment is at room temperature – approximately 72 degrees F (if necessary, bring the test equipment in from outdoors and let it set until the test equipment reaches room temp).
      b. Power on the light source and power meter for at least 5 minutes prior to obtaining measurements.
      c. Clean connectors and adapters with a lint-free wipe and 90% (or higher) isopropyl alcohol.
   4. Do not power off the light source or the power meter during testing activity.

5. Do not remove Test Cord #1 from the light source at any time (unless the testing is complete or the equipment is being put away for the evening).
6. Do not bend the test cords smaller than 20 times the cord diameter (this may induce loss into the cord reducing the accuracy of the measurement).

D. Test Cord Performance Verification
1. Connect Test Cord #1 to the light source and to the power meter.
2. Set this value into the power meter as the reference power (P_{ref}).
3. Disconnect Test Cord #1 from the power meter. Do not disconnect Test Cord #1 from the light source.
4. Connect the 'open' end of Test Cord #1 to an adapter (of matching connector type). Connect one end of Test Cord #2 to that adapter and the other end of Test Cord #2 to the power meter.
5. The value displayed on the power meter represents the test cord #2 connection loss.
6. Flip the ends of Test Cord #2 so that the end connected to the power meter is now connected to the adapter (attached to test cord #1), and the end connected to the adapter is now connected to the power meter.
7. The value displayed on the power meter represents the test cord #2 connection loss on the opposite end.
8. Both connection loss measurements must be less than or equal to the value found in Table 270812-3.1 (below). Replace cord if measure losses exceed table values.

Table 270821-3.1: Acceptable Test Cord Connection Attenuation

	ST or SC Connection	LC and other Mini-Connector
Multimode	0.50 dB Max	0.20 dB Max
Singlemode	0.55 dB Max	0.30 dB Max

9. Repeat this test procedure from the beginning reversing the test cords in order to verify the performance of test cord #1.

E. Test Equipment Set Up
1. Follow the test equipment manufacturer's initial adjustment and set up instructions.
2. Set the power meter to Relative Power Measurement Mode
3. Set the meter to display power levels in dBm.
4. Set the light source and power meter to the same wavelength.

F. Multimode Passive Link Insertion Loss Testing Procedures
1. Only use a light source that exhibits a Category 1 modal launch condition. Confirm the light source's modal launch condition following the procedures described in TIA-526-14A, Annex A.
2. Test Method:
   a. For 'permanent' links, perform the optical power loss testing of multimode fibers according to TIA-526-14A test method B "One Jumper Reference".

G. Singlemode Passive Link Insertion Loss Testing Procedures
   1. Only use test jumpers that comply with the requirements TIA-526-7, 3.1.3.
   2. Test Method:
      a. For 'permanent' links, perform the optical power loss testing of singlemode fibers according to TIA-526-7 test method A.1 "One Jumper-Cable Measurement".

H. Acceptable Measurement Values
   1. The measured loss shall not exceed the calculated loss of the pre-testing submittals.

I. Record Test Measurements:
   1. Permanently record all test data per strand, including the following (minimum):
      a. Project name
      b. Cable identifier, fiber number, and fiber type (e.g., "multimode")
      c. Testing company name
      d. Testing technician's name
      e. Date measurements were obtained
      f. Measurement direction
      g. Wavelength
      h. Loss measurement
      i. Test equipment model and serial number(s)
   2. Measurements shall carry a precision through one significant decimal place, minimum.

PART 4 - TESTING FORMS

4.01 SUMMARY OF FORMS

A. Fiber Optic Test Instrument Data Sheet

B. Fiber Optic Reference Power Measurement Method Form

C. Fiber Optic Relative Power Measurement Method Form

END OF SECTION 27 08 21

SECTION 27 11 00

COMMUNICATIONS EQUIPMENT ROOMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Buildout / fit-up of communications equipment rooms.

B. Related Divisions and Sections:
1. Comply with the Related Sections paragraph of Section 27 00 00.
2. Review Seismic Calculation requirements, specifically in Section 27 00 00, Article 1.05.
3. Drawings, general provisions of the Agreement, and Division 01 apply to this Section.
4. Consult other Divisions, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.

1.02 REFERENCES

A. Comply with the References requirements of Section 27 00 00.

B. In additional to those codes, standards, etc., list in Section 27 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
1. EIA/ECA-310-E, “Cabinets, Racks, Panels, and Associated Equipment”
2. NFPA National Fire Protection Association (NFPA) 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials
3. ASTM E 84-05 Standard Test Method for Surface Burning Characteristics of Building Materials.
4. American Wood-Preservers' Association (AWPA) Standard C27 Plywood - Fire Retardant Treatment by Pressure Processes.

1.03 DEFINITIONS

A. Definitions as described in Section 27 00 00 shall apply to this section.

B. In addition to those Definitions of Section 27 00 00, the following list of terms as used in this specification defined as follows:

1.04 SYSTEM DESCRIPTION

A. General: Communications rooms shall fall into one of the following space titles:
1. Main Distribution Facility
2. Intermediate Distribution Facility

B. Room Functions:
   1. Main Distribution Facility (MDF) will serve the following functions:
      a. Act as minimum point of entry (MPOE) for telecommunications utility (e.g., AT&T)
      b. House telecom utility's termination field(s) and interface between telecom utility's facilities and premises facilities
      c. Houses network equipment (i.e. core switch/router, processing eqmt/servers) and voice system equipment (i.e. PBX and voice mail server)
      d. House interbuilding and intrabuilding twisted pair and fiber optic backbone cabling and main crossconnect field
      e. Houses network equipment (i.e. access switches) serving the horizontal cabling
      f. Houses horizontal termination field – for voice/data/CATV – outlets served from this room (refer to floor plans for area served)
   2. Intermediate Distribution Facilities (IDF) will serve the following functions:
      a. House intrabuilding twisted pair and fiber optic backbone cabling from MDF
      b. House horizontal termination field – both voice and data – of outlets served from this room (refer to floor plans for area served)
      c. House network equipment (i.e. access switch) serving users of the room's service area

C. Work Covered Under Other Sections
   1. Bonding
   2. Grounding busbars
   3. Power and cooling
   4. Conduit, device boxes, and sleeves

D. Base Bid Work
   1. The Work under this section includes materials, accessories, fasteners, etc., and the labor and associated services required for the buildout / fit-up of telecommunications equipment rooms, and includes coordination through the General Contractor with other trades
   2. In general, the Work includes the following:
      a. Submittals
      b. Plywood backboards
      c. Rack bays (equipment racks, vertical management sections, anchoring)
      d. Cable, wire and patch cord management
      e. Overhead and vertical cable support
      f. Seismic bracing
      g. Identification tags and labeling
      h. Record Documents
      i. Warranty

E. Coordination Requirements
   1. Electrical: Coordinate layout with electrical contractor to ensure proper placement of lighting, sequencing of power service to rack bay, and other issues related to electrical trade.
   2. County: Coordinate room-ready requirements and schedule with County (to allow County to plan and execute installation of OFOI telecommunications/ network equipment).

1.05 SUBMITTALS

A. Comply with the Submittal requirements of Section 27 00 00.

B. Quantity: Furnish quantities of each submittal as noted in Section 27 00 00.

C. Submittal Requirements at Start of Construction:
   1. Product Data Submittal
   2. Shop Drawings Submittal: Consisting of any proposed changes to room plans.
   3. Seismic Calculations: Rack anchorage into concrete flooring with overall rack bracing, based on maximum rated load capacity.
   4. Schedule Submittal: Submit proposed schedule of work (this schedule may be combined with the schedule developed for Division 27.

D. Submittal Requirements at Close Out:
   1. As-Built Drawings Submittal

E. Substitutions
   1. Requests for substitutions shall conform to the general requirements and procedure outlined in Section 27 00 00.

1.06 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 27 00 00.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of Section 27 00 00.

1.08 WARRANTY

A. Warrant Work to perform as described within this Section for a period of 1 year. Correct deficiencies within 24 hours of notification.

PART 2 - PRODUCTS

2.01 SHEET HARDWOOD / PLYWOOD (AS BACKBOARD)

A. A HP Grade A Type II (graded in accordance with AWI Premium)

B. Materials shall comply with performance requirements in AWPA C27.

C. The backboard must be 8’ x 4’ virgin plywood sheets, free from defects, and be fire rated.

D. Fire-Retardant Treatment Processes: Plywood shall be chemically treated and pressure impregnated, capable of providing a maximum flame spread classification of 26-75 and a smoke density no greater than 450, in accordance with ASTM E 84.

2.02 FASTENERS, FOR PLYWOOD

A. Bolts:
1. Bolts shall be steel and shall comply with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6).
2. Hex nuts and flat washers shall comply with ASTM A 563 (ASTM F 563M).

B. Concrete Anchors:
1. Expansion anchor bolt and sleeve assemblies shall have a capability to sustain, without failure, a load equal to 6 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing inspecting agency.
2. Materials:
   a. Carbon-steel components, zinc plated to comply with ASTM B 633 Class Fe/Zn 5
   b. Galvanized machine screws or bolts with standard expansion-shield type concrete anchors
3. Manufacturers:
   a. Phillips Drill Co. “Red Head” masonry anchors
   b. Wej-It Expansion Products Inc. “Wej-It” concrete anchors
   c. Or equal

2.03 EQUIPMENT RACK – 2-CHANNEL TYPE

A. Application: Suitable for the support of termination apparatus, cable and cord management apparatus, network equipment, and other similar equipment, within a telecommunications room.

B. Material: High strength, lightweight 6061-T6 aluminum, extrusion construction.

C. Channel:
1. Size: 3” deep, with flanges on each side (“double sided”)
2. Flange: 1.265” wide by 0.25” thick, with mounting holes
3. Mounting Holes: Threaded, spaced at 5/8” - 5/8” - 1/2”, compatible with EIA-310
4. Threading: #12-24 rolled, compatible with EIA-310
5. RMU Markings: The RMU markings shall be permanently stamped on the ‘outside’ of both flanges on both channels.

D. Assembled Rack: Rack shall be complete with two mounting channels, two base angles (3.5" high by 6" deep by .375" thick), two top angles (1.5" high by 1.5" deep by .375" thick), and hardware. Assembled rack shall be 7'-0" or 8'-0" high (overall) by 19" mounting width (20.25" wide overall), and shall contain 45 EIA mounting spaces (1.75")

E. Load Rating: 1,500 lbs when evenly distributed for the height of the rack.

F. Finish: Black, powder coat

G. Manufacturer:
   1. CPI
      a. #46353-703; 7'-0"H x 19" 2-channel equipment rack, 45 RMU, black
      b. #46353-715: 8'-0"H x 19" 2-channel equipment rack, 51 RMU, black
   2. Cooper B-Line
      a. #SB556084XUFB; 7'-0"H x 19" equipment rack, black
      b. #SB556096XUFB; 8'-0"H x 19" equipment rack, black
   3. Or equal

2.04 SEISMIC GUSSET, FOR 2-CHANNEL EQUIPMENT RACK

A. Application: Seismic gusset kit for stiffening and stabilization of critical joints in equipment racks.

B. Manufacturer:
   1. CPI
      a. #11592-701; gusset kit, black
   2. Cooper B-Line
      a. #SB556 GUSSET KIT FB; gusset kit, black
   3. Or equal

2.05 VERTICAL MANAGEMENT SECTIONS

A. Application: Suitable for cable routing, cord routing, and cord slack storage vertically (between the top and bottom) within a rack bay.

B. The vertical management section shall be double-sided (i.e., the management section having covered cable guides on the front and flip-retainers on the rear).

C. Size & Capacity: Refer to the Drawings for sizes and configurations.

D. Mounting: The vertical management section having matching bolt holes for attachment to the rack.

E. Color: black (guides and cover).

F. Manufacturer:
   1. CPI
      a. #40095-703; 7’-0”H x 6”W, “MCS-EFX” double sided, extended depth, black
      b. #40096-703; 7’-0”H x 10”W, “MCS-EFX” double sided, extended depth, black
      c. #40097-703; 7’-0”H x 12”W, “MCS-EFX” double sided, extended depth, black
   2. Cooper / B-Line
      a. #SB86086D084FB; 7’-0”H x 6”W, double sided, black
      b. #SB860810D084FB; 7’-0”H x 10”W, double sided, black
      c. #SB860812D084FB; 7’-0”H x 12”W, double sided, black
   3. Panduit
      a. #NRV6; 7’-0”H x 6”W, double sided, black
      b. #NRV10; 7’-0”H x 10”W, double sided, black
      c. #NRV12; 7’-0”H x 12”W, double sided, black
      d. #NRD6; 7’-0”H x 6”W, dual hinge door, black
      e. #NRD10; 7’-0”H x 10”W, dual hinge door, black
      f. #NRD12; 7’-0”H x 12”W, dual hinge door, black
   4. Or equal

2.06 HORIZONTAL MANAGEMENT PANEL

A. Application: Suitable for installation into equipment rack for horizontal cord management. The horizontal management panel shall match (and fully integrate with) the vertical management sections.

B. The horizontal management panel shall be single-sided.

C. Size: 2U high (refer to Drawings) by 19” mounting wide.

D. Color: black (guides and cover).

E. Manufacturer:
   1. CPI
      a. #35441-702; horizontal management panel, single sided, 2U, black
   2. Cooper / B-Line
      a. #SB814192X6FB; horizontal cable manager with ‘extra large’ rings, 2U, black
   3. Panduit
      a. #NMF2; horizontal cable manager with removable hinged front cover, front only, 2U
   4. Or equal

2.07 RACK BAY ACCESSORIES

A. Double-Sided Equipment Shelf, for 2-Channel Racks
   1. Application: Suitable for installation into equipment rack for equipment and/or computers.
   2. Double sided. Fixed shelf. Fits 3-inch deep channel. <Ventilated> <Solid>
   3. Load capacity: 200 lbs, heavy duty.
   4. Manufacturer:
      a. CPI
         1) #11164-719; fixed shelf, 20" overall depth, solid, black
      b. Cooper / B-Line
         1) #SB596V19103AFB; fixed shelf, 20" overall depth, ventilated, black
         2) #SB596V19153AFB; fixed shelf, 30" overall depth, ventilated, black
         3) #SB596S19103AFB; fixed shelf, 20" overall depth, solid, black
         4) #SB596S19153AFB; fixed shelf, 30" overall depth, solid, black

2.08 CABLE RUNWAY

A. Cable Runway Straight Sections
   1. Application: Suitable for the support & management of telecommunications (and other low voltage) cables, either overhead or mounted vertically on a wall, within Telecommunications Room. Also overhead equipment rack bracing.
   2. Construction: Constructed of two longitudinal side elements – "stringer", with elements periodically crossing between stringers – "rung"; Rungs spaced 12" on center, and welded to stringer.
   3. Material (both stringer and rung): Steel tube, rectangular, 1-1/2" by 3/8" by 0.65" wall thickness.
   4. Size: 9' 11-1/2" straight sections; width: refer to Drawings.
   5. Manufacturers:
      a. CPI
         1) #10250-712; 12"W cable runway, black
         2) #10250-718; 18"W cable runway, black
         3) #10250-724; 24"W cable runway, black
      b. Cooper / B-Line
         1) #SB17U12BFB; 12"W cable runway, black
         2) #SB17U18BFB; 18"W cable runway, black
         3) #SB17U24BFB; 24"W cable runway, black
      c. Or equal

2.09 POWER STRIPS

A. Horizontal Power Strip
   1. Application: Suitable for installation into equipment rack and/or cabinet for power distribution, and oriented horizontally for a 2U 19" rack mounted installation.

2. Input: 208V 30A, with a 6' (minimum) long cord. Output: 12 IEC C13 and 4 IEC C19 outlets.
3. Metered
4. Current Rating: 30 Amps.
5. Manufacturer:
    a. APC
        1) #AP7811; Horizontal PDU, 2U, metered, 30 amp, 208V
    b. Or equal

2.10 RACKS

A. Label plate shall be suitable to affix onto top angle of equipment rack or onto the top front of a frame/cabinet.

B. Label plate shall be 'engrave-able' stock melamine plastic laminate substrate.

C. Size (minimum): 1/2-inch high by 6 inches long by 1/16-inch thick.

D. Color: Black.

E. Lettering shall be white, engraved, 1/8-inch high.

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with the Execution requirements of Section 27 00 00.

3.02 EXAMINATION AND PREPARATION

A. Prior to installation, verify equipment rooms are suitable for the construction scope of this section. Schedule work to prevent damage caused by other trades during the course of that other construction.

B. Prepare surfaces, such as floors, for permanent installation of products, such as racks.

3.03 INSTALLATION

A. Plywood Backboards
    1. General
        a. Complete installation work in a neat, high quality mannerand conform to all applicable federal, state and local codes, and all telephone standards.
        b. Replace or repair work completed by others that is defaced or destroyed by Work associated with installation of the plywood backboards. Contractor shall pay for the full cost of this repair/replacement.
        c. Obtain written authorization from the County's Representative at least one week in advance of any drilling that may produce dust or particles in the air

such as seismic anchorage into concrete sub-floor (so, for example, the Fire Protection System may be deactivated during such drilling).

2. Preparation
   a. Condition wood materials to average prevailing humidity conditions in installation areas prior to installing.
   b. Discard all units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
3. Plywood
   a. Install plywood in accordance with WIC Custom or Premium Quality Standard, as scheduled. Ensure work complies with applicable codes and recognized standards.
   b. Install plywood as indicated on Drawings to the dimensions shown. In lieu of no dimensions, install plywood from +0'-6" to +8'-6" above the finished floor.
   c. Install plywood plumb, level, true, and straight with no distortions. Shim as required using concealed shims.
   d. Trim plywood around electrical and telecommunications outlets.
   e. Install plywood such that the fire rating stamp is visible.
   f. Install plywood to a tolerance of 1/8 inch in 8 feet for plumb and level; and with 1/16 inch maximum offset in flush adjoining, 1/8 inch maximum offsets in revealed adjoining surfaces.
4. Fasteners
   a. Install plywood using bolts, concrete anchors, or other fasteners suitable for the purpose.
   b. Provide nails, screws, anchors and other anchoring devices of the type, size, material, and finish required for application/mounting substrate.
   c. Do not use aluminum fasteners.
   d. Countersink fastener heads on exposed carpentry work and fill holes with wood filler.
5. Painting
   a. Paint plywood backboards with a low-gloss, white (or similar bright color) paint.
   b. Mask the plywood's fire rated symbol/stamp from the paint such that the symbol/stamp is still visible after painting.
6. Cleaning, Finishing, and Protection
   a. Cleaning: Clean finish carpentry work on exposed and semi-exposed surfaces. Touch-up shop-applied finishes to restore damaged or soiled areas.
   b. Protection: Protect and maintain protection to ensure work will be without damage or deteriorating at time of acceptance.

B. Rack Bays
   1. Equipment Racks
      a. Provide parts and accessories required to complete each rack. Completely assemble racks, according to manufacturer's instructions.

b. Anchoring/Bracing
   1) Use concrete anchors approved by structural engineer.
   2) Anchor racks to the structural floor at four points.
   3) Brace racks overhead to overhead cable support where shown on the Drawings.
   4) If required for seismic bracing, provide bracing devices (e.g., brackets, threaded rod with strut, etc.) attached to the wall or structure above using appropriate fasteners.

2. Vertical Management Sections
   a. Provide vertical management sections as shown on Drawings. If not shown, provide a default of one vertical management section between each rack and at either end of the bay.
   b. Bolt vertical management sections to the equipment racks at the points designed by the manufacturer and per the manufacturer's installation instructions.
3. Tolerances:
   a. Equipment Rack: Verify dimensions to establish proper clearances as follows:
      1) Front: 40" clearance from channel's front mounting flange.
      2) Back: 57" clearance from channel's back mounting flange.
   b. Provide the correct amount of space between each rack for proper installation (according to manufacturer's written instructions) of the vertical management sections.
4. Horizontal Management Panels
   a. Provide horizontal management panels as shown on Drawings. If not shown, provide one management panel above each patch panel and on below the bottom patch panel in each rack bay where patch panels occur.
   b. Provide fasteners and parts required to complete the installation.
5. Accessories
   a. Provide rack mounting screws – 1 bag of screws per rack, as come packaged with the rack product. Attach the screws directly to the rack (visible for the punch walk). This shall constitute turn-over to the County.

C. Overhead Cable Support
1. Provide support devices (e.g., brackets and threaded rod with strut) for overhead cable management system; install per the manufacturer's instructions and fastened to the wall or ceiling using appropriate fasteners.
2. Provide parts required for complete installation (e.g., mounting brackets, splice kits, hardware, etc.).
3. Tolerances
   a. Install overhead cable support centered over the equipment rack, or as shown on the Drawings.
4. Interface with Other Work: Coordinate the installation of the overhead cable support with other trades. Trapeze supports and 'hanger rods' ("all-thread"), for example, may be shared to lower overall construction cost.

D. Vertical Cable Support
   1. Provide cable runway installed vertically at the locations as shown on the Drawings for use to support cables routing vertically within telecommunications rooms.
   2. Provide parts required for complete installation (e.g., vertical mounting brackets, bolts, etc.).
   3. When using cable runway, install the runway such that the rungs are facing outward (the greater distance from the rung to the stringer edge is facing inward).

E. Horizontal Power Strips in IDFs
   1. Provide horizontal power strips as shown on Drawings. If not shown, coordinate the installation height with the County / County's Representative. Provide fasteners and parts required to complete the installation.
   2. Route the input cord within designated cable management and provide cord fasteners to prevent movement of the input cord. Plug the input cord into the receptacle designated by the County / County's Representative.

3.04 LABELING

A. General Requirements: Labeling and identifier assignment shall conform to ANSI/TIA-606-B and as approved by County before installation.

B. Equipment Rack Label Requirements: Provide one label plate per rack. Permanently affix label plate and position as shown on the Drawings; if not shown on the Drawings, center the label plate on the rack's front top angle.

C. Identifier Assignment
   1. Equipment Racks
      a. Prefix: "RACK"
      b. First field: the room's identifier; for example: "TR2.1".
      c. Second field: the rack number (sequential numeral); for example: "01".
      d. Example; "RACK TR2.1-01"

3.05 FINAL INSPECTION AND CERTIFICATION

A. Punch the Work of this Section compliant to the requirements of Section 27 00 00.

B. Comply with system acceptance and certification requirements of Section 27 00 00.

END OF SECTION 27 11 00

SECTION 27 13 13

COMMUNICATIONS BACKBONE ISP TWISTED PAIR CABLING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Backbone ISP (inside plant/indoor) twisted pair cabling.

B. Related Sections:
1. Comply with the Related Sections requirements of Section 27 00 00.
2. Section 27 05 26, "Communications Grounding and Bonding"
3. Section 27 08 11, "Communications Twisted Pair Testing"

1.02 REFERENCES

A. Comply with References requirements of Section 27 00 00.

B. In addition to the codes and standards listed in Section 27 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
1. National Fire Protection Agency (NFPA)
   a. NFPA 262, "Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces", 2007
2. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
   a. UL 444, "Communications Cables"
   b. UL 497, "Protectors for Paired-Conductor Communication Circuits"
   c. UL 497A, "Secondary Protectors for Communications Circuits"
   d. UL 497B, "Protectors for Data Communications and Fire-Alarm Circuits"
   e. UL 497C, "Protectors for Coaxial Communications Circuits"
   f. UL 1666, "Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts"
   g. UL 1863, "Communications-Circuit Accessories"
3. Insulated Cable Engineers Association (ICEA)
   a. ANSI/ICEA S-90-661-2008, "Category 3, 5, and 5e Individually Unshielded Twisted Pair Indoor Cable for Use In General Purpose and LAN Communication Wiring Systems"
   b. ICEA S-102-700-2004, "ICEA Standard For Category 6 Individually Unshielded Twisted Pair Indoor Cables (With Or Without An Overall Shield) For Use In Communications Wiring Systems Technical Requirements"
4. Telcordia
   a. GR-111, "Generic Requirements for Thermoplastic Insulated Riser Cable"

1.03 DEFINITIONS

A. Refer to Section 27 00 00 for Definitions.

B. In addition to those Definitions of Section 27 00 00, the following list of terms as used in this specification defined as follows:
   1. "ALVYN": sheath type consisting of corrugated polymer-coated aluminum shield with and adhered flame retardant jacket
   2. "ARMM": Bell system cable type (shielded riser)
   3. "CMP": Communications Media Plenum [NEC plenum rating]
   4. "CMR": Communications Media Riser [NEC riser/non-plenum rating]
   5. "ISP": Inside Plant [cabling]
   6. "PE": Polyethylene
   7. "PIC": Plastic Insulated Conductor
   8. "PVC": Polyvinyl Chloride
   9. "PVDF": Polyvinylidene fluoride

1.04 SYSTEM DESCRIPTION

A. Work Covered Under Other Sections
   1. Pathways: The communications pathways (backbone conduits, riser sleeves, basketway, cable tray, etc.) work will be covered under another Section. Refer to the Drawings for size/capacity and route information.
   2. Rooms: Build out (e.g., backboards, overhead and vertical cable runway, etc.) of the rooms (MDF, BDFs, IDFs) will be covered under another Section. Refer to the Drawings for build out information.

B. Base Bid Work
   1. Provide engineering, labor, materials, apparatus, tools, equipment, and transportation required to make a complete working telecommunications backbone twisted pair cabling system installation described in these specifications and shown on related Drawings.
   2. The Drawings are diagrammatic in nature.
   3. Consider backbone cabling shown on the Drawings as base bid work, unless otherwise noted. This includes terminations at both ends.
   4. In general, the base bid work includes:
      a. Submittals
      b. Backbone inside plant (riser) twisted pair (copper) cables and termination apparatus
      c. Cable management
      d. Crossconnects
      e. Cable identification tags and system labeling
      f. Record Documents
      g. Warranty

1.05 SUBMITTALS

A. Comply with Submittal procedural, quantity, and format requirements of Section 27 00 00.

B. Submittal Requirements Prior To Start Of Construction:
   1. Product Data Submittal, indicating conformance with NEC, UL, TIA/EIA listings, certifications and specifications.
   2. Schedule Submittal, consisting of proposed schedule of work. This schedule may be combined with the schedule developed for Division 27.
   3. Shop Drawings Submittal, consisting of proposed changes to cable routing, or termination locations/configurations.

C. Submittal Requirements at Closeout:
   1. As-Built Drawings
   2. Crossconnection records/cut sheets
   3. O & M Manuals

D. Substitutions
   1. Requests for substitutions shall conform to the general requirements and procedure outlined in Section 27 00 00.

1.06 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 27 00 00.

B. Contractor Qualifications
   1. In addition to the Contractor Qualifications requirements of Section 27 00 00, the Contractor shall be manufacturer certified to install the proposed and submitted cabling system and to provide an extended warranty. Provide satisfactory evidence of certification in the form of a current letter or certificate from the manufacturer as part of the bid submission.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of Section 27 00 00.

1.08 WARRANTY

A. The telecommunications cabling system, as specified in this section, shall carry a 15-year (minimum) extended system warranty. This extended warranty shall cover parts and labor for the duration of the extended warranty. This extended warranty shall also cover electrical performance of cabling system to the specific category per ANSI/TIA/EIA-568-B performance criteria for backbone cabling.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. CommScope SYSTIMAX

B. Leviton / BerkTek

C. Panduit / General Cable

2.02 UNSHIELDED TWISTED PAIR CABLES – PLENUM

A. Application:
   1. Suitable for indoor installation, between floors in vertical riser system, under access flooring, and through overhead ceiling space (in cable tray, conduit, & hangers).
   2. Each and every cable run shall be a continuous single cable, homogenous in nature. Splices are not permitted anywhere.
   3. Twisted pair PIC type, air core cable.

B. Conductors and Insulation:
   1. Annealed solid copper, 24 AWG
   2. Fully insulated, consisting of a flame-retardant PVC or other thermoplastic.
   3. Conductors shall be twisted into pairs. Twisted pairs shall be stranded into 25-pair bundles.
   4. Color Coding: Twisted pairs and units individually color-coded to industry standards (ANSI/ICEA Publication S-80-576, and EIA-230).

C. Core and Sheath:
   1. Cable sheath consisting of an overall flame-retardant PVDF, or equivalent, jacket.

D. Cable shall be NEC rated as CMP, and UL listed as such.

E. Electrical performance of the twisted pairs and overall cable shall comply with TIA/EIA-568-A requirements for Category 3 UTP cabling.

F. Manufacturers:
   1. CommScope SYSTIMAX
      a. #2010 series cables
   2. BerkTek
      a. “Multi-Pair PowerSum” series cables
   3. General Cable
      a. Category 3 Plenum series cables

2.03 TERMINATION APPARATUS – "110 BLOCK" TYPE

A. Application:
   1. Termination apparatus shall be "110 block" type.
   2. Termination apparatus shall be suitable for installation within a telecommunication facility for the termination of the backbone twisted pair cables specified within this Section.
   3. Termination apparatus shall be vertically oriented and suitable for wall-mount and/or rack-mount installations.
   4. Termination apparatus, accompanied by the quantity of management panels, shall provide for both horizontal and vertical routing of cords and crossconnect wires, as shown on the drawings.

B. Manufacturer:
   1. CommScope SYSTIMAX
      a. #110PA2-300FT; 110 Block kit, 300 pair, 5-pair based
      b. #188D3; vertical management panel for 300-pr block
   2. Leviton
      a. #41MB2-3F5; 110 Block frame kit, 300 pair, 5-pair based
      b. #41880-300; vertical cord/wire manager
   3. Panduit
      a. #P110KT3005Y; 110 Block kit, 300 pair, 5-pair based
      b. #P110VCM300; vertical management panel for 300-Pr kit
   4. Ortronics
      a. #OR-30200007; 110 wiring block, 300 pair, with legs
      b. #OR-30200110; IDC connector, 5-pair
      c. #OR-70400272; package of 2 clear label holders and 2 white labels
      d. #OR-30200140; wire/cord trough/manager, with legs

2.04 CROSSCONNECT WIRE

A. Crossconnect wire shall be suitable for installation within a telecommunication facility and fully compatible with the termination apparatus specified within this Section.

B. Crossconnect wire shall be manufactured from a single, continuous length of insulated wire, homogenous in nature. Splices are not permitted anywhere. Factory splices of insulated conductors are expressly prohibited.

C. Conductors:
   1. Conductors: 24 AWG solid copper
   2. Insulation: fully insulated conductors with a flame retardant thermoplastic (such as PVC, or equivalent)
   3. Twisted Pairs: Two insulated conductors "twisted" into a "pair" (twisted pair), individually color-coded.

D. Manufacturer:
   1. Belden B-Plus Crossconnect Wire
      a. #22208250; crossconnect wire, 1 pair, Wh/Bl
   2. CommScope SYSTIMAX
      a. #CCW-F 1/24 S1000; crossconnect wire, 1 pair, Whi-Red / Red-Whi
      b. #CCW-F 1/24 S1000; crossconnect wire, 1 pair, Whi-Blu / Blu-Whi
   3. General
      a. #7023864; crossconnect wire, 1 pair, Red-Whi / Whi-Red
   4. Superior Essex
      a. #12-101-13; crossconnect wire, 1 pair, Red-Whi
      b. #12-103-13; crossconnect wire, 1 pair, Whi-Blu
   5. Or equal

2.05 LABELS

A. Labels shall be machine printable with a laser printer, ink jet printer, thermal transfer printer, or hand-held printer.

B. Labels for Cables
   1. Labels shall be adhesive-backed and have a self-laminating feature
   2. Labels shall fit the backbone cables listed above (i.e., shall fully wrap around the cable's jacket).
   3. Printable area should be 1 inch wide x 0.5 inch high, or larger
   4. Printable area color shall be white
   5. Manufacturer:
      a. Panduit
         1) #S200X400YAJ; labels for 25 to 100 pair cables [0.32" (8.09mm) - 0.95" (24.26mm) dia.]
         2) #S200X650YAJ; labels for 100 to 400 pair cables [0.48" (12.13mm) – 1.59" (40.43mm) dia.]
      b. Or equal

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with the Execution requirements of Section 27 00 00.

3.02 EXAMINATION AND PREPARATION

A. Rooms: Prior to installation, verify equipment rooms are suitable to accept the backbone twisted pair cables and terminations.

B. Pathways: Prior to installation verify that pathways and supporting devices, provided under other sections, are properly installed, and that temporary supports, devices, etc., have been removed. Verify dimensions of pathways, including length (for example, "True Tape" the conduits).

C. Cable Integrity: Prior to installation, verify the twisted pair cable is fully operational – both cable sheath and twisted pair conductors. Documentation of pre-installation testing is not a close out requirement, and is the responsibility of the Contractor.

3.03 INSTALLATION

A. Backbone Cable Installation and Routing
   1. Cable runs shall have continuous sheath continuity, homogenous in nature. Splices are not permitted anywhere.
   2. Maximum cable length of 500 meters from the termination within the MDF to the termination in the IDFs.
   3. Placement
      a. Place cables within designated pathways.
      b. Maintain a minimum bend radius of 6 times the cable diameter during and after installation.
      c. Maintain pulling tension within manufacturer's limits.
      d. Place and suspend cables in a manner to protect them from physical interference or damage. Place cables with no kinks, twists, or impact damage to the sheath. Replace cables if damaged during installation
      e. Place a pull rope along with cables where run in conduit and spare capacity still exists in the conduit. Tie off ends of the pull rope.
   4. Routing
      a. When routing horizontally within telecommunications rooms, utilize the overhead cable support. When routing vertically within telecommunications rooms, utilize the vertical cable support and provide cable ties every 24 inches on center using.
      b. Route cables a minimum of 6" away from power sources to reduce interference from EMI.
   5. Termination
      a. Provide 15 feet cable slack loop at each end of the run. Store slack in overhead cable support or as noted on Drawings.
      b. Properly relieve strain from cables at termination points per manufacturer’s instructions.
      c. Terminate twisted pairs onto the termination apparatus in accordance with manufacturer’s latest instructions and TIA/EIA-568-B standard installation practices.
      d. Perform post-installation testing as described in section 270811.

B. Termination Apparatus
   1. Provide accessories required for a complete installation.
   2. Install the termination apparatus to the dimensions shown on the Drawings. If the dimensions are not shown, install the termination apparatus such that the bottom row of terminations is no lower than 24 inches (+/- 3”) AFF and the top row of terminations is no higher than 60 inches (+/- 3”) AFF.
   3. Mount termination apparatus plumb and square.

C. Crossconnects
   1. In the MDF, provide one 1-pair crossconnect to length from the equipment field to the backbone field based on the records from the IDF crossconnections.
   2. Utilize the horizontal and vertical management components to properly route the crossconnect wire.
   3. Color:
      a. For digital handsets, provide: White-Blue / Blue-White
      b. For analog handsets, provide: White-Red / Red-White
   4. Splices in crossconnect wire are prohibited.

3.04 LABELING

A. General Requirements
   1. Labeling and identifier assignment and the label colors shall conform to the TIA/EIA-606-A Administration Standard and as approved by County or County's Representative before installation.
   2. Provide permanent and machine-generated labels; hand written labels will not be accepted.

B. Cable Labels
   1. Label Format:
      a. Label type shall be wrap-around self-laminating.
      b. Label color shall be white background with clear laminating window.
      c. Text color shall be black; text height shall be 1/8" high, minimum, or #12 font size.
   2. Provide labels on both ends of cables. Fully wrap label around the cable jacket. Install labels no more than 4 inches from the edge of the cable jacket. Install labels such that they are visible by a technician from a normal stance.

C. Termination Apparatus Labels
   1. Use labels included in the product packaging. For substitutions, request approval by the Engineer.
   2. Label color shall be white for respective field type, per TIA/EIA-606-A.
   3. Text color shall be black, 3/32" high, minimum, or #10 font size.

D. Identifier Assignment
   1. General: Separate label fields of the identifier with a hyphen.
   2. Backbone ISP Twisted Pair Cables
      a. The first field shall identify the cable type: "CBT" (for Cable, Backbone, Twisted pair).
      b. The second field shall identify the originating termination room identifier as shown on the plans; e.g., "BDF2.1".
      c. The third field shall identify the ending termination room identifier as shown on the plans; e.g., "IDF2.2".
      d. The fourth field shall identify the beginning and ending pair counts.
      e. Identifier Example: "CBT-BDF2.1-IDF2.2-0401-0600"

3. Termination Positions at the 110 Termination Blocks
   a. The first field shall identify the origination / destination room; for example "TO IDF2.2".
   b. The second field shall identify the pair count range; for example, "0401-0450"
   c. Identifier Example: "TO IDF2.2 0401 - 0450".

3.05 FINAL INSPECTION AND CERTIFICATION

A. Punch the Work of this Section compliant to the requirements of Section 27 00 00.

B. Remove and replace with new, at no cost to the County, cables or conductors failing to meet the indicated standards and not passing the testing requirements of Section 270811. The County, or County's Representative, will not accept the installation until testing has indicated a 100% availability of all cables and conductors or the County or County's Representative has approved any deviation from this requirement.

C. Comply with system acceptance and certification requirements of Section 27 00 00.

END OF SECTION 27 13 13

SECTION 27 13 23

COMMUNICATIONS BACKBONE ISP FIBER OPTIC CABLING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Backbone ISP (indoor) fiber optic cabling.

B. Related Sections:
   1. Comply with the Related Sections paragraph of Section 27 00 00.
   2. 27 08 21 Communications Fiber Optic Testing

1.02 REFERENCES

A. Comply with References requirements of Section 27 00 00.

B. In addition to the codes and standards listed in Section 27 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
   1. National Fire Protection Agency (NFPA)
      a. NFPA 262, "Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces", 2007
   2. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
      a. UL 1569, "Metal-Clad Cables"
      b. UL 1651, "Optical Fiber Cable"
      c. UL 1666, "Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts"
   3. Insulated Cable Engineers Association (ICEA)
      a. ANSI/ICEA S-83-596-1994, "Fiber Optic Premises Distribution Cable"
      b. ANSI/ICEA S-87-640-1999, "Fiber Optic Outside Plant Communications Cable"
      c. ANSI/ICEA S-104-696-2001, "Indoor-Outdoor Optical Cable"
   4. Telcordia
      a. GR-409-CORE, Issue 2, "Generic Requirements for Indoor Fiber Optic Cable"

1.03 DEFINITIONS

A. Refer to Section 27 00 00 for Definitions.

B. In addition to those Definitions of Section 27 00 00, the following list of terms as used in this specification defined as follows:
   1. "MM": Multimode [fiber type]
   2. "OFCP": Optical Fiber Conductive Plenum, plenum rating

3. "OFCR": Optical Fiber Conductive Riser, non-plenum riser rating
4. "OFNP": Optical Fiber Non-conductive Plenum, plenum rating
5. "OFNR": Optical Fiber Non-conductive Riser, non-plenum riser rating
6. "OFN": Optical Fiber Non-conductive, general purpose indoor rating
7. "PVC": PolyVinyl Chloride
8. "SM": Singlemode [fiber type]

1.04 SYSTEM DESCRIPTION

A. Work Covered Under Other Sections
   1. Pathways: The communications pathways (backbone conduits, riser sleeves, basketway, cable tray, etc.) work will be covered under another Section. Refer to the drawings for size/capacity and route information.
   2. Rooms: Build out (e.g., backboards, overhead and vertical cable support, etc.) of the telecommunications rooms will be covered under another Section. Refer to the drawings for build out information.

B. Base Bid Work
   1. Provide engineering, labor, materials, apparatus, tools, equipment, and transportation required to make a complete working telecommunications backbone fiber optic cabling system installation described in these specifications and shown on related drawings.
   2. The drawings are diagrammatic in nature.
   3. Consider Backbone cabling, as shown on drawings, as base bid work, unless otherwise noted, including terminations at both ends.
   4. In general, the base bid work includes:
      a. Submittals
      b. Backbone inside plant (riser) fiber optic cables and terminations
      c. Bonding (cable armor, termination apparatus, etc.)
      d. Cable management
      e. Cable identification tags and system labeling
      f. Record Documents
      g. Warranty

1.05 SUBMITTALS

A. Comply with Submittal procedural, quantity, and format requirements of Section 27 00 00.

B. Submittal Requirements Prior To Start Of Construction:
   1. Product Data Submittal, indicating conformance with NEC, UL, TIA/EIA listings, certifications and specifications.
   2. Schedule Submittal, consisting of proposed schedule of work. This schedule may be combined with the schedule developed for Division 27.
   3. Shop Drawings Submittal, consisting of proposed changes to cable routing, or termination locations/configurations

C. Submittal Requirements at Closeout:
   1. Copy of the manufacturer's printed reel documentation, including the following.
      a. Manufacturer's reel number
      b. Manufacturer's traceable batch number
      c. Length of the fiber cable on the reel
      d. Maximum attenuation
      e. Minimum bandwidth
   2. As-Built Drawings
   3. O&M Manuals

D. Substitutions
   1. Requests for substitutions shall conform to the general requirements and procedure outlined in Section 27 00 00.

1.06 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 27 00 00.

B. Contractor Qualifications
   1. In addition to the Contractor Qualifications requirements of Section 27 00 00, the Contractor shall be manufacturer certified to install the proposed and submitted cabling system and to provide an extended warranty. Provide satisfactory evidence of certification in the form of a current letter or certificate from the manufacturer as part of the bid submission.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of Section 27 00 00.

1.08 WARRANTY

A. The backbone fiber optic cabling system, as specified in this section, shall carry a 15-year (minimum) extended system warranty. This extended warranty shall cover parts and labor for the duration of the extended warranty. This extended warranty shall also cover optical performance of cabling system.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. CommScope SYSTIMAX

B. Corning Cable Systems

C. Leviton

D. Panduit

2.02 FIBER OPTIC CABLE – INTERLOCKED ARMOR PLENUM RATED

A. Application:
   1. Cable shall be suitable for indoor installation, between floors in vertical riser system, under access flooring, and through overhead ceiling space (in basketway, cable tray, conduit, and/or hangers).
   2. Optical transmission performance shall not be significantly affected by environmental fluctuations, installation, or aging.
   3. Materials shall not evolve hydrogen in quantities that will increase light attenuation.

B. Multimode 50/125 μm fiber strands shall meet or exceed the following geometry criteria:
   1. Core diameter = 50 μm, ±3.0 μm
   2. Cladding diameter = 125 μm, ±1.0 μm
   3. Core/Cladding Concentricity = ≤ 3 μm
   4. Minimum Tensile Strength = 100,000 psi

C. Multimode 50/125 μm fiber strands shall meet or exceed the following performance criteria:
   1. Attenuation = 3.0 dB/km at 850 nm and 1.0 dB/km at 1300 nm wavelengths, maximum
   2. Overfilled Bandwidth = 1,500 MHz•km at 850 nm and 500 MHz•km at 1300 nm wavelengths, minimum
   3. Effective Modal Bandwidth = 2,000 MHz•km at 850 nm and 500 MHz•km at 1300 nm wavelengths, minimum

D. Singlemode fiber strands shall meet or exceed the following geometry criteria:
   1. Core diameter = 8.3 μm
   2. Mode field diameter = 8.8 μm, ±0.5 μm
   3. Cladding diameter = 125 μm, ±1.0 μm
   4. Core/Cladding Concentricity = ≤ 0.8 μm
   5. Minimum Tensile Strength = 100,000 psi

E. Singlemode fiber strands shall meet or exceed the following performance criteria:
   1. Attenuation = 0.7 dB/km at 1310 nm and 0.7 dB/km at 1550 nm wavelengths, maximum
   2. Cutoff wavelength = 1260 nm
   3. Dispersion = 3.5 ps/nm•km at 1285-1330 nm and 18 ps/nm•km at 1550 nm
   4. Singlemode fiber shall meet the specifications of the following:
      a. International Telecommunication Union (ITU) ITU-T G.652.D classification for low water peak (LWP) singlemode fiber
      b. International Electrotechnical Commission (IEC) 60793-2-50 "Sectional Specification for Class B single-mode fibers", Class B1.3

F. Primary Coating:
   1. Each fiber shall be completely covered with a "primary coating" (acrylate material).
   2. Coating diameter = 250 μm, ±5 μm

G. Buffering:
   1. Each coated fiber shall be fully covered with a material extruded over and directly onto the coating. This shall be the tight buffer. Tight buffer diameter = 900 μm, ±5 μm. Material = PVC, or equivalent flame retardant thermoplastic.
   2. Buffered strands shall be individually color-coded to meet the requirements of ANSI/TIA/EIA-598-A-1995. (Also, ref. ANSI/ICEA S-83-596-1994, and EIA-230)

H. Cable Sheath:
   1. Strength Element: The cable shall have an internal strength element such as aramid yarn (e.g., Kevlar).
   2. Inner Jacket: The cable shall have a seamless inner jacket (material = PVC, or equivalent) applied to and completely covering the internal components (fiber strands, strength element, other).
   3. Armor: The cable shall have an interlocking metallic armor applied spirally and longitudinally to and completely covering the cable.
   4. Outer Jacket: The cable shall have a seamless outer jacket (material = PVC, or equivalent) applied to and completely covering the armor.
   5. Tensile Strength: The cable shall have a 150-lb, minimum, rated load.
   6. Flame Rating: NEC (Article 770) rated as OFCP, and UL listed as such.

I. Manufacturer:
   1. CommScope SYSTIMAX
      a. #5201-024A-XPAQ-APAQ; 24 strand, 50/125μm, interlock armor, aqua, OFCP rated
      b. #5201-024A-WPYL-APYL; 24 strand, singlemode, interlock armor, yellow, OFCP rated
   2. Corning Cable Systems
      a. #024T88-33190-A3; 24 strand, 50/125μm, interlock armor, aqua, OFCP rated
      b. #024E88-33131-A3; 24 strand, singlemode, interlock armor, yellow, OFCP rated
   3. Or equal

2.03 TERMINATION APPARATUS – FIBER OPTIC PATCH PANELS

A. Application:
   1. Fiber optic patch panels shall be an enclosed housing for protecting, storing and organizing the termination of fiber cable(s) and fiber strands, shall provide means to strain relieve and support of the specified cables, shall contain facilities to store fiber slack, and shall provide patch cord management.

2. Fiber optic patch panels shall be passive physical equipment and apparatus used in terminating, interconnecting, and cross-connecting fiber optic cabling, shall possess a minimum fire resistant rating of UL94V-1, and shall conform to existing OSHA Health and Safety Laws.
3. Fiber optic patch panels shall be rack-mountable.

B. Fiber optic patch panels shall come equipped with safety labels such as laser identification or warning labels as required by system considerations.

C. Manufacturer:
1. CommScope SYSTIMAX
   a. #600G2-2U-MOD-SD; "600G2 Modular" type patch panel, sliding, 2U, retains 8 "G2" modules
   b. #MODG2-12LC-LS; "G2 Module" e/w 12 LazrSPEED MM LC adapters
   c. #MODG2-12LC-SM; "G2 Module" e/w 12 TeraSPEED SM LC adapters
2. Corning Cable Systems
   a. #CCH-02U; "Connector Closet Housings" type patch panel, 2U, 4 adapter modules
   b. #CCH-CP12-E4; Adapter Module e/w 6 duplex MM LC aqua adapters
   c. #CCH-CP12-A9; Adapter Module e/w 6 duplex SM LC blue adapters
3. Leviton
   a. #5R2UH-S06; "Opt-X Ultra" type patch panel, 2U, 6 adapter modules
   b. #5F100-12A; adapter plate e/w 6 duplex MM LC aqua adapters
   c. #5F100-12Z; adapter plate e/w 6 duplex SM LC blue adapters
   d. #5RCMP-KIT; "Opt-X Ultra" ultra cable clamp kit
4. Panduit
   a. #FMRE2; fiber optic patch panel, 2U, 6 adapter modules
   b. #FAP6WAQDLC: adapter panel with 6 duplex LC multimode adapters, aqua
   c. #FAP6WBUDLCZ; module with 6 duplex LC singlemode adapters, blue
5. Or equal

2.04 LABELS

A. Labels shall be machine printable with a laser printer, ink jet printer, thermal transfer printer, or hand-held printer.

B. Labels for Cables
1. Labels shall be adhesive-backed and have a self-laminating feature
2. Labels shall fit the backbone cables listed above (i.e., shall fully wrap around the cable's jacket).
3. Printable area should be 1 inch wide x 0.5 inch high, or larger
4. Printable area color shall be white
5. Manufacturer:
   a. Panduit
      1) #S200X225YAJ; labels cables 0.24" (6.06mm) - 0.48" (12.13mm) dia.

2) #S200X400YAJ; labels for cables 0.32" (8.09mm) - 0.95" (24.26mm) dia.
3) #S200X650YAJ; labels for cables 0.48" (12.13mm) - 1.59" (40.43mm) dia.

b. Or equal

2.05 MISCELLANEOUS

A. Fiber Slack Storage Reel: Leviton #48900-OFR, or equal

B. Velcro Cable Ties
1. Width: .75".
2. Color: Velcro cable ties the same color as the cable to which it is being applied.
3. Manufacturers:
a. Panduit
1) #HLS-15R-0 Black, 15' roll, cut to length.
b. Or equal

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with Execution requirements of Section 27 00 00.

3.02 EXAMINATION AND PREPARATION

A. Pathways: Prior to installation verify pathways (conduits, etc.) and supporting devices, provided under other sections, are properly installed, and that temporary supports, devices, etc., have been removed. Verify dimensions of pathways, including length (for example, "True Tape" the conduits).

B. Rooms: Prior to installation, verify equipment rooms are ready for cables and terminations.

C. Prior to installation, verify cables and conductors are fully operational – both cable sheath and fiber strands. Pre-installation testing is the responsibility of the Contractor, though documentation of pre-installation testing is not a close out requirement.

3.03 INSTALLATION

A. Backbone Cable Installation, Routing, and Termination
1. Cable runs shall have continuous sheath continuity, homogenous in nature. Splices are not permitted anywhere.
2. Do not exceed 500 meters optical conductor length from the termination within the MDF to the termination in the IDFs.
3. Placement
a. Place cables within designated pathways.

b. Maintain a minimum bend radius of 20 times the cable diameter during installation, and a minimum bend radius of 10 times the cable diameter after installation.
c. Maintain pulling tension within manufacturer's limits.
d. Place and suspend cables in a manner to protect them from physical interference or damage. Place cables with no kinks, twists, or impact damage to the sheath. Replace cables damaged during installation.
e. Do not use cable-pulling compounds for indoor installations.
f. Provide 20 feet of cable slack at each end within the Telecommunications Rooms; store slack in fiber slack storage reel mounted on the wall.
g. Place a pull rope along with cables where run in pathways and spare capacity in the pathway remains. Tie off ends of the pull rope.

4. Routing
   a. When routing overhead within telecommunications rooms, neatly dress and organize cables on designated overhead cable support apparatus (for example, cable tray/runway), and fasten cables to cable support apparatus via approved straps. When routing vertically within telecommunications rooms, neatly dress and organize cables on vertical cable support apparatus (for example, vertical cable runway), and properly fasten cables to cable routing facilities via approved straps. "Properly fasten" shall consist of cable ties in a 'crossed' configuration per cable or cable bundle (up to three cables) every 24 inches on center.
5. Termination
   a. Properly relieve strain from cables at termination points (at/within the fiber optic termination panels) per manufacturer's instructions.
   b. Bond cable armor to grounding point (busbar) – refer to section 270526 for additional information.
   c. Terminate fiber strands via pigtail splicing at both ends using the specified fiber optic pigtail appropriate for the mode type of the fiber. Splicing type shall be fusion; mechanical splicing will not be accepted. Perform terminations in accordance with manufacturer's instructions.
   d. Provide required accessories and consumables for the complete termination of fiber strands.
   e. Provide 3 feet of unsheathed fiber (tight buffer) slack within the patch panel/termination enclosure at each end of the link. Properly store fiber slack in rear of patch panel into the 'routing rings', per manufacturer's instructions. Include 'extension' slack loop/fold in the rear of the shelf to allow for the drawer to be pulled out without putting tension on the fibers.

B. Fiber Optic Cable Termination Panel
   1. Provide fully assembled termination panel in designated equipment rack; locate per drawings (if not shown, locate at the top). "Fully assembled" includes installation and mounting components and accessories such as adapter panels, coupling adapters, etc. required for operation.
   2. Provide accessories required for proper installation of each termination panel, including connector panels and adapters.

3. Bond termination apparatus to grounding point (busbar) – refer to section 270526 for additional information.

3.04 LABELING

A. General Requirements
   1. Labeling, identifier assignment, and the label colors shall conform to the TIA/EIA-606-A Administration Standard and as approved by County or County's Representative before installation.
   2. Provide permanent and machine generated labels; hand written labels will not be accepted.

B. Cable Labels
   1. Label Format:
      a. Label type shall be wrap-around self-laminating.
      b. Label color shall be white background with clear laminating window.
      c. Text color shall be black; text height shall be 1/8" high, minimum, or #12 font size.
   2. Provide labels on both ends of cables. Fully wrap label around the cable jacket. Install labels no more than 4 inches from the edge of the cable jacket. Install labels such that they are visible by a technician from a normal stance.

C. Termination Apparatus Labels
   1. Use labels included in the product packaging. For substitutions, request approval by the Engineer.
   2. Label color shall be white for respective field type, per TIA/EIA-606-A.
   3. Text color shall be black, 3/32" high, minimum, or #10 font size.

D. Identifier Assignment
   1. General: Separate all label fields of the identifier with a hyphen.
   2. Backbone ISP Fiber Optic Cables
      a. The first field shall identify the cable type: "CBF" (for Cable, Backbone, Fiber optic).
      b. The second field shall identify the originating termination room identifier as shown on the plans; e.g., "BDF2.1".
      c. The third field shall identify the ending termination room identifier as shown on the plans; e.g., "IDF2.2".
      d. The fourth field shall identify the type and number of strands; for example, "Mxxx" where "M" stands for multimode and xxx stands for the ending fiber strand sequential count
      e. Identifier Example: "CBF-BDF2.1-IDF2.2-M025-M048"
   3. Termination Positions at the Termination Panels
      a. Make the first field of the identifier the destination room; for example "TO IDF2.2".
      b. Make the second field of the identifier the strand count range; for example, "M025-M048"

c. Identifier Example: "TO IDF2.2 M025-M048".

3.05 FINAL INSPECTION AND CERTIFICATION

A. Punch the Work of this Section compliant to the requirements of Section 27 00 00.

B. Remove and replace with new, at no additional cost, cables with conductors failing to meet the indicated standards and not passing the testing requirements of Section 270821. The County, or County's Representative, will not accept the installation until testing has indicated a 100% availability of cables and conductors or the County or County's Representative has approved in writing any deviation from this requirement.

C. Comply with system acceptance and certification requirements of Section 27 00 00.

END OF SECTION 27 13 23

SECTION 27 15 13

COMMUNICATIONS HORIZONTAL TWISTED PAIR CABLING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Horizontal Twisted Pair Cabling (subsystem of Telecommunications Cabling Infrastructure)

B. Related Sections:
1. Comply with the Related Sections requirements of Section 27 00 00
2. 27 08 11 Communications Twisted Pair Testing
3. 27 13 13 Communications Backbone Twisted Pair Cabling

1.02 REFERENCES

A. Comply with the References requirements of Section 27 00 00.

B. In addition to the codes and standards listed in Section 27 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
1. National Fire Protection Agency (NFPA)
   a. NFPA 262, "Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces", 2007
2. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
   a. UL 444, "Communications Cables"
   b. UL 1666, "Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts"
   c. UL 1863, "Communications-Circuit Accessories"
3. Insulated Cable Engineers Association (ICEA):
   a. ANSI/ICEA S-90-661-2008, "Category 3, 5, and 5e Individually Unshielded Twisted Pair Indoor Cable for Use In General Purpose and LAN Communication Wiring Systems"
   b. ICEA S-102-700-2004, "ICEA Standard For Category 6 Individually Unshielded Twisted Pair Indoor Cables (With Or Without An Overall Shield) For Use In Communications Wiring Systems Technical Requirements"
4. Telcordia
   a. GR-111, "Generic Requirements for Thermoplastic Insulated Riser Cable"

1.03 DEFINITIONS

A. Refer to Section 27 00 00 for Definitions.

B. In addition, define the following list of terms as used in this specification as follows:
   1. "CAT6A": Category 6 Augmented [UTP] performance grade
   2. "Channel": End to end transmission path; e.g., the entire portion of the horizontal cabling to each outlet consisting of the Permanent Link, line cord (at the workstation), patch cord, and, if a full crossconnection is implemented, the crossconnect termination/connecting apparatus and equipment cord.
   3. "CMP": Communications Media Plenum [NEC plenum rating]
   4. "CMR": Communications Media Riser [NEC riser {non-plenum} rating]
   5. "FEP": Fluorinated Ethylene Propylene
   6. "FTP": Foiled Twisted Pair
   7. "PE": Polyethylene
   8. "Permanent Link": Test configuration for a horizontal cabling link excluding patch cords, equipment cords, and line cords; e.g., the 'permanent' portion of the horizontal cabling to each outlet consisting of cable, consolidation point (if used), termination/connecting apparatus in the telecommunications and the connector at the outlet.
   9. "PVC": PolyVinyl Chloride
   10. "UTP": Unshielded Twisted Pair

1.04 SYSTEM DESCRIPTION

A. Work Covered Under Other Sections
   1. Pathways: The communications pathways (basketway, conduits, stubs, etc.) work will be covered under another Section. Refer to the contract drawings for size/capacity and route information.
   2. Rooms: Build out (e.g., backboards, overhead and vertical cable runway, etc.) of the telecommunications rooms will be covered under another Section. Refer to the contract drawings for build out information.

B. Base Bid Work
   1. Provide engineering, labor, materials, apparatus, tools, equipment, and transportation required to make a complete working communications Horizontal Twisted Pair Cabling System installation described in this Section and shown on related drawings. Consider Horizontal Cabling as shown on contract drawings as base bid work, unless otherwise noted. This includes terminations at both ends.
   2. In general, the base bid work includes:
      a. Submittals
      b. Horizontal cables, terminations, and outlets
      c. Cable management
      d. Patch cords and crossconnections
      e. Cable identification tags and system labeling
      f. Record Documents
      g. Warranty

C. Jack Wiring: T568B.

1.05 SUBMITTALS

A. Comply with the Submittals article of Section 27 00 00 for procedural, quantity, content, and format requirements.

B. Substitutions
   1. Conform to substitutions requirements and procedure in Section 27 00 00.

C. Submittal Requirements at Start Of Construction:
   1. Product Data Submittal, indicating conformance with NEC, UL, TIA/EIA listings, certifications and specifications.
   2. Sample Submittal, consisting of the following components:
      a. Type "A" Outlet Sample – one fully configured outlet including faceplate, modular jacks, and label
      b. Cable Label Sample
   3. Schedule Submittal, consisting of proposed schedule of work. This schedule may be combined with the schedule developed for 27xxxx series Sections
   4. Shop Drawings Submittal, consisting of proposed changes to cable routing, or termination locations/configurations

D. Submittal Requirements at Closeout:
   1. As-Built Drawings
   2. Cable ID –to– Office Number Key: Submit a "cable ID-to-Office number key" as an electronic file in an MS-Excel spreadsheet file format containing a list of every cable identifier associated with the final office number
   3. Crossconnection records/cut sheets
   4. O & M Manuals

E. Posted Documentation
   1. Post one full size plot of as-built drawings, specifically the floor plans and (as applicable) reflected ceiling plans, within IDFs such that show the IDF's serving area. Coordinate location with County.

1.06 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 27 00 00.

B. Contractor Qualifications
   1. In addition to the Contractor Qualifications requirements of Section 27 00 00, the Contractor shall be certified by the manufacturer to provide the cabling system (proposed, submitted, and approved) and to provide an extended warranty. Submit satisfactory evidence of certification in the form of a current letter or certificate from the manufacturer as part of the bid.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Delivery, Storage and Handling requirements of Section 27 00 00.

1.08 WARRANTY

A. The horizontal cabling system, as specified in this section, shall carry a 15-year (minimum) extended system warranty. This extended warranty shall cover parts and labor for the duration of the extended warranty. This extended warranty shall also cover electrical performance of cabling system to the specific category per ANSI/TIA/EIA-568-C performance criteria for horizontal cabling.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. CommScope SYSTIMAX cabling system

B. Panduit cabling system

C. Berk-Tek (cable) and Leviton (connectivity) cabling system

2.02 SUBSTITUTIONS

A. Comply with the Substitutions requirements of Section 27 00 00.

2.03 HORIZONTAL CABLE – CAT6A PLENUM (CMP) RATED

A. Application: Suitable for indoor installation, within ceiling space in primary and secondary pathways.

B. Conductors:
   1. Insulated Conductors: 23 AWG solid copper, fully insulated with a flame retardant thermoplastic material (material = FEP, or equivalent).
   2. Twisted Pairs: Two insulated conductors “twisted” into a “pair” (twisted pair) with individually color-coded twisted pairs to industry standards (ANSI/ICEA Publication S-80-576-1994, and EIA-230).

C. Cable Sheath:
   1. Outer Jacket: seamless outer jacket (material = LS-PVC, or similar) applied to and completely cover the internal components (twisted pairs).
   2. Flame Rating: NEC (Article 800) rated as CMP, and UL listed as such.

D. Electrical Performance: Meet or exceed TIA/EIA-568-C.2, ISO 11801 Class E Edition 2.1, and IEEE Std. 802.3an channel requirements for supporting 10GBASE-T.

E. Manufacturer:
   1. CommScope SYSTIMAX
      a. #2091 004 ABL 4/23 R1000; CAT6A 4 pair UTP cable “GigaSPEED X10D”, CMP, blue
      b. #2091 004 AWH 4/23 R1000; CAT6A 4 pair UTP cable “GigaSPEED X10D”, CMP, white

c. #2091 004 AGR 4/23 R1000; CAT6A 4 pair UTP cable "GigaSPEED X10D", CMP, green
d. #2091 004 AYL 4/23 R1000; CAT6A 4 pair UTP cable "GigaSPEED X10D", CMP, yellow

2. Panduit
   a. #PUP6AM04BU-UG; CAT6A 4 pair UTP cable "10Gig", CMP, blue
   b. #PUP6AM04WH-UG; CAT6A 4 pair UTP cable "10Gig", CMP, white
   c. #PUP6AM04YL-UG; CAT6A 4 pair UTP cable "10Gig", CMP, yellow
   d. #PUP6AM04GR-UG: CAT6A 4 pair UTP cable "10Gig", CMP, green

2.04 MODULAR PATCH CORDS – CAT6A RATED

A. Application: Suitable for indoor installation within a telecommunications room or workstation environment.

B. Cords shall be factory-assembled from a single, continuous length (no splices permitted) of cordage, homogenous in nature, and terminated at both ends via 8 position modular plugs.

C. Cordage
   1. Insulated Conductors: 23AWG stranded copper, fully insulated with a flame retardant thermoplastic material (such as PVC, or equivalent).
   2. Twisted Pairs: Two insulated conductors "twisted" into a "pair" (twisted pair), and individually color coded.
   3. Unshielded sheath and flame-retardant polyvinyl chloride (PVC) jacketed.
   4. Flame Rating: NEC CM (or higher) rated, and UL listed as such.

D. Electrical Performance: Meet or exceed ANSI/TIA-568-C.2 and ISO/IEC 11801 requirements for CAT6A UTP cabling.

E. Length: Refer to Outlet Schedule for length requirements.

F. Manufacturer:
   1. CommScope
      a. GS10E "SYSTIMAX X10D" series patch cords
   2. Panduit
      a. TX6A 10Gig Series Patch Cords

2.05 TERMINATION APPARATUS – MODULAR PATCH PANEL, CAT6A RATED

A. Application: Panels shall be suitable for installation within a telecommunication room (IDF) for the termination of the horizontal cables specified herein. Panels shall be horizontally oriented for a rack-mounted configuration. Panels shall be capable of supporting, organizing, labeling and patching/ crossconnecting between the horizontal termination field and the equipment termination field.

B. Modular patch panel shall have 110-type termination, and shall be compatible with the specified horizontal cables both electrically and physically.

C. Mechanical Performance: Each port shall be an 8-position modular jack, compliant to ANSI/TIA-568-C.2 (2 5.7).

D. Electrical Performance: Each port shall meet or exceed TIA/EIA-568-C.2 6.8 and ISO/IEC 11801 requirements for CAT6A UTP cabling through the cable termination and patch cord connection.

E. Manufacturer:
   1. CommScope
      a. #1100AGS5-48; CAT6A modular patch panel "GigaSPEED X10D", angled, 48 ports
   2. Leviton
      a. #6A587-U48; CAT6A modular patch panel "eXtreme 6A", angled, 48 ports
   3. Panduit
      a. #DPA486X88TGY; CAT6A modular patch panel "DP6 10Gig", angled, 48 ports
   4. Or equal

2.06 HORIZONTAL CABLE SUPPORT BAR

A. Application: Suitable to support horizontal cables behind patch panels from vertical cable managers to termination point.

B. Color: Match rack.

C. Manufacturer
   1. CPI
      a. #12176-701
   2. Panduit
      a. #SRB19BLY; 'extended' strain relief bar
      b. #SRBS19BL-XY; 'straight' strain relief bar
      c. #SRBCT; 'straight' strain relief bar with cable tie clips
   3. Or equal

2.07 MODULAR CONNECTOR / 8-POSITION JACK – CAT6A RATED

A. Application: Modular connectors (jacks) for termination of 4-pair UTP cables; modular connectors shall be compatible with the 4-pair cables specified herein this section both electrically and physically.

B. Mechanical Performance: Modular jacks shall be 8-position, compliant to ANSI/TIA-568-C.2.

C. Electrical Performance: Each jack shall meet or exceed TIA/EIA-568-C.2 and ISO/IEC 11801 requirements for CAT6A UTP cabling.

D. Manufacturer:
   1. CommScope
      a. #MGS600-112; CAT6A 8-position "GigaSpeed X10D" jack, orange
      b. #MGS600-262; CAT6A 8-position "GigaSpeed X10D" jack, white
   2. Leviton
      a. #6A10G-RW6; CAT6A modular connector/jack, "eXtreme 6A", white
      b. #6A10G-RO6; CAT6A modular connector/jack, "eXtreme 6A", orange
   3. Panduit
      a. #CJ6X88TGWH; CAT6A 8-position jack "Mini-Com" series "TX6 10Gig", White
      b. #CJ6X88TGOR; CAT6A 8-position jack "Mini-Com" series "TX6 10Gig", Orange

2.08 WORK AREA OUTLETS

A. Faceplates for Standard Flush-Mount Outlets
   1. Application: Faceplates shall be suitable for indoor installation for standard 1-gang and 2-gang flush-mount devices.
   2. Faceplates shall have 2, 3, 4, or 6 ports, and shall include required accessories, such as icons, blank inserts, label windows and labels.
   3. Color: White
   4. Manufacturer:
      a. CommScope
         1) #M12L-262; faceplate, 1-gang, 2 port, White
         2) #M14L-262; faceplate, 1-gang, 4 port, White
         3) #M16L-262; faceplate, 1-gang, 6 port, White
      b. Leviton#42080-2WS;"QuickPort" faceplate, 1-gang, 2 positions, white
         2) #42080-4WS;"QuickPort" faceplate, 1-gang, 4 positions, white
         3) #42080-6WS;"QuickPort" faceplate, 1-gang, 6 positions, white
      c. Panduit
         1) #CFP2WH; faceplate, "Classic" series, 1-gang, vertical, 2 ports, white
         2) #CFP4WH; faceplate, "Classic" series, 1-gang, vertical, 4 ports, white

B. Faceplate for Wall Phone Outlets
   1. Application: Faceplates shall be suitable for indoor installation for standard 1-gang flush-mount device equipped with 1 modular jack and two mounting studs for standard wall-mount telephones.
   2. Faceplates shall include required accessories, such as icons, blank inserts, label windows and labels.
   3. Manufacturer:
      a. CommScope SYSTIMAX
         1) #M10LW-262; wall phone faceplate, White
      b. Panduit

1) #KWP6P, wall phone faceplate, stainless steel, with CAT6 jack

C. Faceplates for Modular Furniture Mount Outlets
   1. Four port faceplates for modular furniture that fits into _" x _" opening.
   2. Color: Confirm with furniture vendor.
   3. Manufacturer
      a. TBD

D. Outlet Frame, for Modular Furniture, Floor Box
   1. Outlet frame shall be duplex/"106"/Decora style.
   2. Color: Confirm with furniture vendor.
   3. Manufacturer:
      a. TBD

E. Surface Outlets
   1. Application: Surface outlets shall be suitable for indoor installation for surface-mount device and shall be fully compatible with the specified modular connectors/jacks.
   2. Color: White
   3. Manufacturer:
      a. CommScope
         1) #M102SMB-B-262; surface outlet box, 2 ports, White
      b. Panduit
         1) #CBX2WH-AY; surface outlet box, "Mini-Com" series, 2 ports, white

F. "Poke-Thru" Floor Outlets
   1. Adapters that are fully compatible with both the "poke-thru" type floor outlets and the specified connectors / connector accessories.
   2. Manufacturer:
      a. Wiremold
         1) #CM2-U2ATT; bezel adapter, accepts 2 SYSTIMAX M-Series connectors
         2) #CM2-U1ATT; bezel adapter, accepts 1 SYSTIMAX M-Series connectors
         3) #CM2-U2KEYA; bezel adapter, accepts 2 'keystone' mount connectors
         4) #CM2-U1KEYA; bezel adapter, accepts 1 'keystone' mount connectors.

G. Bezel Adapters
   1. Adapters fully compatible with Wiremold's "Open Systems" devices and Panduit Mini-Com connectors.
   2. Manufacturer:
      a. Panduit
         1) #CHI2MEI-X; bezel adapter, 2 port, accepts Mini-Com connectors
   3. Adapters fully compatible with Wiremold's "Ortronics Systems" devices and Panduit Mini-Com connectors.

4. Manufacturer:
    a. Panduit
        1) #CH02MEI-X; bezel adapter, 2 port, accepts Mini-Com connectors

H. Faceplates for Furniture Feeds
1. Application: Suitable for indoor installation for standard 1-gang flush-mount device box with round opening allowing cables to freely exit (towards furniture system entry).
2. Color: Confirm with furniture vendor.
3. Manufacturer:
    a. Leviton
        1) # 80704-4; faceplate with 1.4” round opening

2.09 LABELS

A. Labels shall be machine printable with a laser printer, ink jet printer, thermal transfer printer, or hand-held printer.

B. Labels for Horizontal Cables
1. Adhesive backed labels and self-laminating feature.
2. Fit the horizontal cables listed above (i.e., shall fully wrap around the cable’s jacket).
3. Size: 2”x.05” printable area, minimum
4. Color: white
5. Manufacturer:
    a. Panduit
        1) #S100X150YAJ; labels for cable diameters 0.16”-0.32”, white, desktop printer (laser or ink jet)
    b. Or equal

2.10 MISCELLANEOUS COMPONENTS

A. Velcro Cable Ties
1. Width: .75”.
2. Color: Black
3. Manufacturers:
    a. Panduit “Tak-Ty” series cable ties
    b. Panduit
        1) #HLS-15R-0; black, 15’ roll, cut to length.
    c. Or Equal

B. Plenum Cable Ties
1. Application: for use in plenum or air handling spaces
2. Color: maroon or other distinctive non-white color
3. Manufacturer:
    a. Panduit
        1) #PLT1M-xxxx

2) #PLT2S-xxxx
3) #PLT3S-xxxx

b. Or equal.

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with the Execution requirements of Section 27 00 00.

3.02 EXAMINATION AND PREPARATION

A. Rooms: Prior to installation, verify equipment rooms are suitable to accept the horizontal cables and terminations.

B. Pathways: Prior to installation verify that pathways and supporting devices, provided under other sections, are properly installed, and that temporary supports, devices, etc., have been removed. Verify dimensions of pathways, including length (for example, "True Tape" the conduits).

C. Cable Integrity: Prior to installation, verify the cable's integrity – both sheath and conductors. Documentation of pre-installation testing is not a close out requirement, and is the responsibility of the Contractor.

3.03 INSTALLATION

A. Cable Installation and Routing
1. Cable runs shall have continuous sheath continuity, homogenous in nature. Splices are not permitted anywhere.
2. Place cables within designated pathways, such as cable tray, basketway, cable hangers, etc. Do no fasten (such as with cable ties) or attach cables to other building infrastructure (such as ducts, pipes, conduits, etc), other systems (such as ceiling support wires, wall studs, etc), or to the outside of conduits, cable trays, or other non-approved pathway systems.
3. Place and suspend cables and conductors during installation and termination in a manner to protect them from physical interference or damage. Place cables with no kinks, twists, or impact damage to the sheath. Replace cables damaged during installation or termination at no additional cost.
4. Maintain **minimum** cable length of 15 meters from the termination in the IDF to the termination at the user's faceplate (permanent link).
5. No cable length shall exceed 90 meters from the termination point in the IDF to the termination point at the work area (permanent link).
6. Route cables at 90-degree angles, allowing for bending radius, along corridors for ease of access.
7. Do not exceed manufacturer's limits for pulling tension.
8. Do not use cable-pulling compounds for indoor installations.

9. Maintain a minimum bend radius of 6 times the cable diameter during and after installation.
10. Route cables under building infrastructure (such as ducts, pipes, conduits, etc); Do not route cables over building infrastructure. The installation shall result in easy accessibility to the cables in the future.
11. Place cables 6", minimum, away from power sources to reduce interference from EMI.
12. Place a pull string along with cables where run in pathways and spare capacity in the pathway remains. Tie off ends of the pull string (to prevent the string from falling into the conduit).
13. Neatly dress and organize cables using designated cable routing facilities, and fasten to support devices via approved ties.
14. When exiting the primary pathway (such as basketway or cable tray) to the work area, exit via the top of the pathway. Secure the cables to the pathway using an approved cable tie.

B. Cable Routing and Dressing within the IDF
   1. Place cables within the overhead cable support and, when routing vertically, fasten the cables onto wall-mounted vertical cable support every 24 inches on-center using cable ties.
   2. At the rack bay, route cables into the back of the vertical management sections (do not route cables into the front as this space is reserved for patch cords only). Divide the cables equally between both sides of an equipment rack such that a cable does not travel past the midpoint of the rack prior to termination. Dress and cut cables to length required to reach the designated termination point with no excess cable and slack left in the horizontal cable manager, vertical cable manager, and overhead cable support.
   3. Provide 10 feet, minimum, sheathed cable slack – length not to exceed permanent link maximum length requirement. Place the slack in the overhead cable support.

C. Termination in the IDF
   1. Provide termination apparatus and accessories required for a complete installation. Install and assemble termination apparatus, accessories and associated management apparatus according to the manufacturer's instructions.
   2. Properly strain relieve cables to and at termination points per manufacturer's instructions.
   3. Terminate cables and twisted pairs in accordance with manufacturer's latest installation requirements and ANSI/TIA-568-C.0 standard installation practices. Terminate cable pairs onto the termination apparatus. Terminate twisted pairs compliant to ANSI/TIA-568-C.0 and wired per 1.04 System Description.
   4. Modular Patch Panels and Horizontal Management Panels
      a. Provide quantity of modular patch panels to support termination of cables served from respective IDF. Provide quantity of horizontal management panels based on the quantity of patch panels.
      b. Install and assemble modular patch panels and horizontal management panels according to the manufacturer's instructions.

c. Install the patch panels and the horizontal management panels as shown on the contract drawings. If configuration is not shown, install the patch panels in association with the horizontal management panels such that a management panel is mounted above and below given patch panel.

5. Termination Sequence
   a. Terminate the cables in sequential order using the link's identifier starting at the top left and completing a panel before moving to the next panel below.

D. Cable Routing and Dressing at the Work Areas
1. Provide 2-4 feet, minimum, sheathed cable slack – length not to exceed permanent link maximum length requirement. Place the slack within ceiling space neatly on a cable hanger.
2. Routing to Furniture-Mount Faceplates
   a. Route cables from primary or secondary pathway within ceiling through the furniture-feed pathway (stub within wall) into opening at bottom of furniture. Exercise caution to prevent scraping, cutting, or other damage to cable's jacket.
   b. Provide spiral wrap around cables from furniture-feed pathway to point where cables enter furniture.

E. Termination at the Work Areas
1. Provide device components, connectors, and accessories required for a complete installation. Install and assemble connectors, jacks, adapters, termination apparatus, accessories and associated management apparatus according to the manufacturer's instructions.
2. Provide six inches, minimum, sheathed cable slack behind each workstation outlet faceplate. Coil the slack cable inside the raceway, within the wall, or in the junction box (if used), per the cabling manufacturer's installation standards.
3. Wall-Mount Faceplates
   a. Install devices at heights shown on the contract drawings. If no heights are shown, install at 24" AFF on center (+/- 3").
   b. Mount faceplates plumb, square, and at the same level as adjacent device faceplates.
   c. Patch gaps around faceplates so that faceplate covers the entire opening.
4. Furniture-Mount Faceplates
   a. Coordinate installation of faceplate adapters with the furniture contractor, including color.
   b. Mount faceplate adapters into the designated opening for telecommunications cabling.
5. Terminate cables and twisted pairs in accordance with manufacturer's latest installation requirements and ANSI/TIA-568-C.0 standard installation practices. Terminate twisted pairs compliant to ANSI/TIA-568-C.0 and wired per 1.04 System Description.

F. Perform post-installation testing as described in the Telecommunication Testing specification (refer to Section 27 08 11). Replace terminations and connectors not passing the required media test.

G. Patching and Crossconnecting
   1. In IDFs, provide modular patch cords as shown on contract drawings for network service. If not shown, provide one modular patch cord per complement/device; install between the network switch and the horizontal field. Neatly dress patch cords within the horizontal and vertical management components. Store cord slack within the vertical management section.

3.04 LABELING

A. General Requirements
   1. Labeling, identifier assignment, and label colors shall conform to ANSI/TIA/EIA-606-A Administration Standard and as approved by the County before installation.
   2. Permanent labels with machine-generated text (hand written labels will not be accepted).

B. Label Formats
   1. Horizontal Cable Labels
      a. Text Attributes: Black, 1/8” high, minimum, or #12 font size.
      b. Install labels on both ends of cables no more than 4" from the edge of the cable jacket. Install labels such that they are visible by a technician from a normal stance.
   2. Patch Panel Labels
      a. Use modular patch panel labels included in the product packaging. Request approval by the Engineer for other labels.
      b. Use a label color for the respective field type, per TIA/EIA-606.
      c. Text Attributes: Black, 3/32” high, minimum, or #10 font size.
   3. Termination Block Labels
      a. Use labels included in the product packaging. Any deviation from this requirement must be approved in writing by the County.
      b. Use a label color for the respective field type, per TIA/EIA-606-A.
      c. Text Attributes: Black, 3/32” high, minimum, or #10 font size.
   4. Outlet Labels
      a. Use outlet labels included in the product packaging. Any deviation from this requirement must be approved in writing by the County.
      b. Label Background: White.
      c. Text Attributes: Black, 1/8” high, minimum, or #12 font size.
      d. Install label in the top label window. Leave the bottom label window blank.

C. Identifier Assignment
   1. General: Separate label fields of the identifier with a hyphen.

2. Horizontal Cables
   a. First field: the originating room identifier; for example: “A2.1”.
   b. Second field: the destination room number; for example: “207”.
   c. Third field: the cable’s intended service type followed by a unique sequential number; for example: “V1” (voice, cable #1) or “D2” (data, cable #2).
   d. Fourth field: the cable type; for example: “CAT3” or “CAT5E”.
   e. Example: “A2.1–207–D2–CAT5E”
3. Outlets
   a. First field: the originating room identifier; for example: “A2.1”.
   b. Second field: the destination room number; for example: “207”.
   c. Third field: a unique sequential number; for example: “01”.
   d. Example: “A2.1–207–01”
4. Individual Ports at the Outlets
   a. The specified faceplate has individual port numbers molded into the product. However, if a substitution is accepted that does not have port numbers, provide port labels as follows.
   b. First field: the cable’s intended service type followed by a unique sequential number; for example: “V1” (voice, cable #1) or “D2” (data, cable #2).
5. Individual Ports at Patch Panels
   a. First field: the destination room number; for example: “207”.
   b. Second field: the cable’s intended service type – for example: “D” (data), and a unique sequential number – for example: “2”.
   c. Example: “207–D2”

3.05 FINAL INSPECTION AND CERTIFICATION

A. Punch the Work of this Section compliant to the requirements of Section 27 00 00.

B. Remove cables and replace with new those failing to meet the indicated standards and not passing the testing requirements of Section 27 08 11 with no impact to cost and schedule. The County will not accept the installation until testing has indicated a 100% availability of all cables and conductors. Any deviation from this requirement must be approved in writing by the County

C. Comply with system acceptance and certification requirements of Section 27 00 00.

END OF SECTION 27 15 13

SECTION 27 41 13

INTEGRATED PROJECTION SCREENS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Roll-up, electrically operated projection screens.

B. Related Sections:
   1. Section 05 50 00 - Metal Fabrications: Metal fasteners and other support components for suspending projection screens.
   2. Section 06 10 53 – Miscellaneous Rough Carpentry: Wood blocking for installation of projection screens.
   3. Section 09 29 00 - Gypsum Board: Suspended gypsum board ceilings to contain recessed projection screens.
   4. Section 09 51 00 - Acoustical Ceilings: Suspended acoustical panel ceilings to adjoin recessed projection screens.
   5. Division 26: Electrical supply, conduit, and wiring for motorized projection screens.

1.2 SUBMITTALS

A. See section 270000 for submittal requirements

B. Bidder is responsible for coordination with all affected trades for the integration of substituted products.

1.3 QUALITY ASSURANCE

A. Source limitation: Obtain projection screens from a single manufacturer as a complete unit including necessary mounting hardware, motor, controls, limit switches, and accessories.

B. Motorized projection screens shall bear UL label and be certified for use in the United States by Underwriters Laboratory (UL), Inc.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver projection screens when building is enclosed, other construction within spaces where screens will be installed is substantially complete, and installation of screens is ready to begin.

B. Deliver products in manufacturer's original, unopened, undamaged containers with labels intact.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Da-Lite Screen Company, 3100 North Detroit Street, Post Office Box 137 Warsaw, IN 46581-0137, (800) 622-3737

B. Draper, Inc., 411 South Pearl Street, Spiceland, Indiana 47385-0425; (765) 987-7999.

C. Stewart Filmscreen, 1161 West Sepulveda Blvd., Torrance, California 90502; (310) 784-5300.

D. Manufacturers of equivalent products submitted and approved in accordance with project product substitution procedures.

2.2 FLUSH IN-CEILING MOTORIZED PROJECTION SCREENS

A. Schedule

Room	Viewing Area (H x W)	Comments	Enclosure (H x W x D)
Training 215	65” x 116”	Supply screen with sufficient black drop to position bottom of image at 48” AFF, UON.	7 ¼” x 134 ½” x 7 ¾”

B. Type: Recessed, plenum-rated, electrically-operated, retractable projection screen with rigid metal roller housing screen motor and screen tensioning system; Tensioned Advantage Electrol Screen as manufactured by Da-Lite Screen Company, Inc. or equivalent from Draper, Inc. or Stewart Filmscreen.

C. Unless otherwise noted, provide a low-voltage interface integrated within the projection screen enclosure.

D. Low-voltage interface shall provide connection points for Contractor-installed field wiring.

E. Method of installation: Recessed in ceiling.

F. Screen case: Extruded aluminum with steel end brackets designed to receive mounting hardware.
   1. Ceiling flange: Case is to be provided with a bottom flange to accommodate adjacent ceiling finish.
   2. Case access door: A door shall be provided at the bottom of the case to permit access to the roller.

G. Finish: White, powder coating unless otherwise noted.

H. Tensioning system: Tab guide cable system shall be provided to maintain even lateral tension and to hold viewing surface flat.

I. Integral junction box: Projection screen housing shall contain connector for connection to motorized roller/viewing surface assembly. Housing can be installed and wired to electrical supply during construction. Motorized roller assembly shall be installed later after construction is substantially complete.

J. The screen fabric shall be permanently attached to the roller. The bottom of the screen shall be weighted.

2.3 MOTOR

A. Type: 110-120 VAC, 60 HZ, 3-wire, instantly reversible, lifetime lubricated, and equipped with internal thermal overload protector, electric brake, and pre-set accessible limit switches

B. Integrated in screen roller on vibration insulators.

2.4 CONTROLS

A. Low voltage control: Unless otherwise noted, provide single-gang Decora-type control with pushbuttons or membrane switches for up, down and stop functions and with an electrical interface providing contact closure outputs for interface with projection screens and remote control systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of projection screens with ceiling construction and related components penetrating or above ceilings such as lighting fixtures, mechanical equipment, ductwork, and fire-suppression system.

B. Coordinate requirements for blocking, structural supports, and bracing to ensure adequate means for installation of screens.

C. Coordinate requirements for power supply conduit, and wiring required for projection screen motors and controls.

D. Coordinate installation of recessed mounted screens with construction of suspended acoustical panel where appropriate. Where acoustical ceiling panels are to be adhered to screen case closure, provide and coordinate required tolerances and weight restrictions.

E. Prior to installation, verify type and location of power supply.

3.2 INSTALLATION

A. Install projection screens and controls at locations and heights indicated on Drawings.

B. Comply with screen manufacturer's written instructions and shop drawings.

C. Install screen housing and make electrical connections prior to installation of suspended ceiling system. After interior construction is essentially complete, install viewing surface and drive assembly in housing.

D. Install screens securely to supporting substrate so that screens are level and back of case is plumb.

E. Provide required brackets, hanger rods, and fasteners.

F. Adjust limit switches to position bottom of projection screen image areas at 48” AFF or as otherwise noted.

G. Adjust tensioning lines to eliminate ripples and other non-flat areas of fabric.

3.3 TESTING AND DEMONSTRATION

A. Test motorized projection screens to verify that screen, controls, limit switches, closure, and other operating components are functional. Ensure that screen is level and viewing surface plumb when extended. Correct deficiencies.

B. Demonstrate operation of screen to Owner's designated representatives.

3.4 PROTECTING

A. Protect projection screens after installation from damage from construction operations. If damage occurs, remove and replace damaged components or entire unit as required to provide units in their original, undamaged condition.

END OF SECTION 27 41 13

SECTION 27 41 16

INTEGRATED AUDIOVISUAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. General: Provide turnkey audiovisual systems, to include equipment and materials, whether specifically mentioned herein or not, to ensure complete and operating systems.

B. The requirements described in this section include the following:
1. References
2. Definitions
3. System Descriptions
4. Submittals
5. Quality Assurance
6. Coordination
7. Project Management and Coordination
8. Delivery, Storage, and Handling
9. Scheduling
10. Warranty
11. Maintenance
12. Project Closeout and Record Documents

C. Refer to Bidding Requirements, Contract Forms, Conditions of Contract, and Division 1, General Requirements. Provisions listed or specified therein apply to work under this section.

D. Related Divisions and Sections: Coordinate the work of this section including, but not limited to, the following other divisions, sections, and trades:
1. Division 01: General requirements
2. Section 274113: Projection screens
3. Section 062000: Finish carpentry
4. Division 23: Heating, ventilating, and air conditioning systems
5. Division 26: Electrical systems
6. Division 27: Communications systems

E. Alternates: Submit a written request for modification to an installation practice desired or required which is contrary to these specifications or drawings. Obtain written approval from the Consultant prior to performing modifications.

F. Unit Prices: Submit unit prices, as derived from the quotations in the Schedule of Values, for adjustments to the contract price. Include in unit prices, material, both explicitly specified, as well as additional components required for a complete and

functional installation, labor, shipping, tax, markups (overhead, profit, job expenses, bond), labeling, records, and as-built drawing production costs.

1.02 REFERENCES

A. Comply with the References requirements of Section 27 00 00.

B. Codes: Perform Work and furnish materials and equipment under Division 27 in accordance with applicable requirements of the latest edition of governing codes, rules and regulations including but not limited to the following minimum standards, whether statutory or not:

1. California Code of Regulations (CCR):
    a. Title 8, "Industrial Relations"
        1) Chapter 3.22, "California Occupational Safety and Health Regulations (CAL/OSHA)"
    b. Title 24, "California Building Standards Code"
        1) Part 1, "California Building Standards Administrative Code"
        2) Part 2, "California Building Code" (CBC)
        3) Part 3, "California Electrical Code" (CEC)
        4) Part 11, "California Green Building Standards Code" (CALGeen)"
2. National Fire Protection Agency (NFPA)
    a. NFPA 70, "National Electrical Code" (NEC)
    b. NFPA 75, "Protection of Information Technology Equipment"
3. International Code Council
    a. International Building Code (2009)
    b. International Fire Code (2009)
    c. ICC Performance Code (2009)
4. Other national, state, and local binding building and fire codes

C. In additional to the references (codes, standards, etc.) listed in Section 27 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

D. Perform work in accordance with applicable requirements of governing codes, rules and regulations including the following minimum standards, whether statutory or not:

1. FCC Federal Communications Commission
2. City, and other local codes and requirements
3. UL Underwriters Laboratories
4. ASTM American Society for Testing Materials
5. NEMA National Electrical Manufacturers Association
6. ANSI American National Standards Institute
7. ETL Electrical Testing Laboratories
8. SMPTE Society of Motion Picture and Television Engineers
9. EIA Electronic Industries Association
10. ISO International Standards Organization

11. Sound Systems Engineering, 2nd Ed., Davis and Davis, Howard W. Sams Co., 1987

E. Provide products and systems that comply with the following standards:
1. ANSI/InfoComm 1M-2011: Audio Coverage Uniformity in Enclosed Listener Areas
2. ANSI/InfoComm 3M-2011: Projected Image System Contrast Ratio
3. NFPA 262: Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces
4. UL 813: Commercial Audio Equipment
5. UL 1419: Professional use Video and Audio Equipment
6. UL 1480: Speakers for Fire Alarm, Emergency, and Commercial and Professional Use
7. UL 1492: Audio-Video Products and Accessories
8. UL 60065-1: Audio, Video and Similar Electronic Apparatus

1.03 DEFINITIONS

A. Definitions in Section 27 00 00 apply to this section.

B. In addition to those Definitions of Division 01, the following list of terms as used in this specification are defined as follows:
1. "A/R": Indicates that the quantity of an item is as required to meet the design criteria indicated in the audiovisual drawings.
2. "A/S": Indicates that the quantity of an item is as shown on the technology drawings.
3. "Cabling": A system comprised of cables, wire, cords, and connecting hardware [e.g., cables, termination apparatus, patch panels, blocks, connectors, outlets, labeling, etc.]
4. "Connect": To install required patch cords, equipment cords, cross-connect wire, etc. to complete an electronic or optical signal circuit
5. "Custom" indicates systems or components the Contractor fabricates based on these specifications and drawings
6. "Furnish": To purchase, procure, acquire, and deliver complete with related accessories
7. "Install": To set in place, join, unite, fasten, link, attach, set up or otherwise connect together and test before turning over to the County, parts, items, or equipment supplied by contractor or others. Make installation complete and ready for regular operation
8. "OFE": County Furnished Equipment
9. "Provide": To furnish, transport, install, erect, connect, test and turn over to the County, complete and ready for regular operation
10. "Or equal" indicates an item that is equal in function and performance to the specified device or system.
11. "Shall" denotes a mandatory requirement
12. "Should" denotes an advisory statement

13. ”Will” indicates an informative statement

1.04 SYSTEM DESCRIPTIONS

A. General
1. This project’s audiovisual systems are based on a number of standard room types. Each room of a certain type is similar to others of its type, with minor layout differences to accommodate project architecture.
2. Refer to the plans for the quantities of each type of room.
3. Refer to the project drawings for specific audiovisual interface information.
4. In circumstances where the specifications and drawings conflict, the drawings govern quantity and the specifications govern quality.
5. Where video conferencing is required, “soft codec” systems will be provided. No appliance-type codecs will be used for this project.

B. Huddle
1. No audiovisual systems will be provided.

C. Collaboration Areas/Open Huddles (Basement near column B.5/5, Basement near A.5/4, 317, Level 3 A/8)
1. Video
   a. Provide a single display in each location. Mount it on a pole provided in the Interiors package, on the wall, or freestanding as indicated in the Technology plans.
   b. Provide wireless presentation capability. This system will use the facility’s Wi-Fi system to allow content to be shared from users’ laptops, tablets, and smartphones.
2. Audio
   a. No sound amplification will be provided.

D. Small Conference/Team Conference (111, 127, 306, 417)
1. Audio
   a. A project-standard speakerphone will be provided for these rooms from the telephone equipment package.
2. Video
   a. Provide a single wall mounted display.
   b. Provide a wired HDMI input in a wall box.
   c. Provide a scaling receiver at the display.
   d. Provide a camera.
   e. Provide wireless presentation capability. This system will use the facility’s Wi-Fi system to allow content to be shared from users’ laptops, tablets, and smartphones.

3. Control
    a. Provide a touch panel for audiovisual system control. It will control all audiovisual system components.
    b. In a wall box, provide a USB connection to the room's audiovisual system. This will allow the use of Skype/GoToMeeting/WebEx software to host and join meetings from the room.
4. Environment/furnishings
    a. The audiovisual system will be concealed in a credenza. The credenza will be provided by others – not with the audiovisual system package.

E. Small Conference (420)
1. Audio
    a. Provide a steerable, table-mounted microphone. A white LED ring will indicate it is on. A red LED indicates it is muted.
    b. Provide ceiling loudspeakers
    c. Provide an audio signal processor with acoustic echo cancellation.
    d. Provide amplification.
2. Video
    a. Provide a single wall mounted display.
    b. Provide a video matrix switch
    c. Provide a wired HDMI input in a tabletop cable access port.
    d. Provide a scaling receiver at the display.
    e. Provide a camera.
    f. Provide wireless presentation capability. This system will use the facility's Wi-Fi system to allow content to be shared from users' laptops, tablets, and smartphones.
3. Control
    a. Provide a touch panel for audiovisual system control. It will control all audiovisual system components.
    b. Provide, at the tabletop, a USB connection to the room's audiovisual system. This will allow the use of Skype/GoToMeeting/WebEx software to host and join meetings from the room.
4. Environment/furnishings
    a. Install the audiovisual system in a credenza. The credenza will be provided by others – not with the audiovisual system package.

F. Large Team Conference (114, 205)
1. Audio
    a. Provide table-mounted microphones. A green LED ring will indicate it is on. A red LED indicates it is muted.
    b. Provide ceiling loudspeakers.

c. Provide an audio signal processor with acoustic echo cancellation
d. Provide an amplifier to power the ceiling loudspeakers.

2. Video
   a. Provide a single wall-mounted display.
   b. Provide a camera.
   c. Provide wireless presentation capability. This system will use the facility's Wi-Fi system to allow content to be shared from users' laptops, tablets, and smartphones
   d. Provide an HDMI input at the tabletop.
   e. Provide an auto-switching video extender kit with scaling receiver.
3. Control
   a. Provide a touch panel for audiovisual system control. It will control all audiovisual system components.
   b. Provide, at the tabletop, a USB connection to the room's audiovisual system. This will allow the use of Skype/GoToMeeting/WebEx software to host and join meetings from the room
   c. Provide a control processor.
4. Environment/furnishings
   a. Install the audiovisual system in a credenza. The credenza will be provided by others – not with the audiovisual system package.

G. Large Conference (228)
1. Audio
   a. Provide in-table microphones. Green LED rings will indicate mics are on. Red LED rings will indicate mics are muted.
   b. Provide ceiling loudspeakers
   c. Provide an audio processor with acoustic echo cancellation.
   d. Provide amplification.
2. Video
   a. Provide a single wall mounted display.
   b. Provide wireless presentation capability. This system will use the facility's Wi-Fi system to allow content to be shared from users' laptops, tablets, and smartphones
   c. Provide a video matrix switch.
   d. Provide hard-wired HDMI connection at the tabletop per the AV drawings.
   e. A laptop will be provided by ITD as a fixed provision.
   f. Provide two, wall-mounted PTZ cameras.
   g. Provide as an add-alternate, a streaming device to allow meeting participants to view sessions on their portable devices. Participants will be required to log into sessions via a password or PIN.
   h. Provide as an add-alternate, meeting recording capability.

3. Control
    a. Provide a touch panel for audiovisual system control. It will control all audiovisual system components.
    b. Include lighting and window covering controls.
    c. Provide, at the tabletop, a USB connection to the room's audiovisual system. This will allow the use of Skype/GoToMeeting/WebEx software to host and join meetings from the room.
4. Environment/furnishings
    a. Install the audiovisual system in a credenza or in a rack or cabinet in an adjacent room. The credenza will be provided by others – not with the audiovisual system package.

H. Training Room (215)
1. Audio
    a. Provide wireless clip-on microphones for instructors.
    b. Provide an overhead loudspeaker system to amplify instructors' voices.
    c. Provide overhead microphones to pick-up trainees' voices
    d. Provide an audio signal processor with acoustic echo cancellation.
    e. Provide amplification.
    f. Provide an Assistive Listening System (ALS).
2. Video
    a. Provide a single projection system, coordinated with an electrically-operated roll-down screen included in a different spec section.
    b. Provide a streaming device as a means to allow training participants to view presentations on their laptops, tablets, etc. Trainees will be required to log into trainings via a password or PIN.
    c. Provide a video matrix switch.
    d. Provide an in-wall HDMI input at the lecturer's station.
    e. Provide a scaling receiver at the projector.
    f. Provide a wall-mounted PTZ camera.
3. Control
    a. Provide a touch panel for audiovisual system control. It will control all audiovisual system components.
    b. Provide a USB connection in an in-wall interface panel at the instructor position to the room's audiovisual system. This will allow the use of Skype/GoToMeeting/WebEx software to share trainings from this room to remote locations. It will also allow trainings to be recorded via the capabilities in the web meeting software
4. Environment/furnishings
    a. Coordinate the location of connection provisions at the instructor position with the Owner's presentation furniture selection.

b. Install the audiovisual system in a credenza or in an adjacent room. If in a credenza, this will be provided by others – not with the audiovisual system package.

5. Add Alternate 1
   a. Provide as an additive alternate, a recording and streaming device with increased storage capacity for recordings.

I. Stadium Conference (217)
1. Audio
   a. Provide a wireless clip-on microphone for presenters.
   b. Provide a loudspeaker system attached to the display to amplify program content and presenters' voices. Use only minimal voice amplification because of the size and distance of the listening area and to prevent ringing and feedback.
2. Video
   a. Provide a single wall mounted display.
   b. Provide wireless presentation capability. This system will use the facility's Wi-Fi system to allow content to be shared from users' laptops, tablets, and smartphones.
3. Control
   a. Provide a pushbutton remote control panel. It will have buttons for power on and off, volume up and down, and a limited number of other functions.

J. Video Studio and Control Room
   a. No audiovisual system will be provided for this area.

K. Reception (227)
1. Audio
   a. See Portable Systems.
2. Video
   a. Provide digital signage displays.
   b. Provide a digital signage player behind each display. Each will require a data connection.
3. Control
   a. The system will be controlled using the handheld remote controls provided with the displays.
   b. The digital signs will be programmed via a computer on the ITD computer network. Software included in the digital signage package will allow content to be scheduled independently or synchronously for all displays.
4. Misc.
   a. Install the displays on a mounting structure included in the Interiors package.

L. Offices (415, 419, 421)
1. Audio
    a. No audio systems will be provided. Sound will be amplified through the rooms' TVs.
2. Video
    a. Provide a wall-mounted display
    b. Provide an input plate beneath the display with an HDMI input.
    c. Provide a transmitter at the desk with HDMI and VGA inputs.
3. Control
    a. Provide a pushbutton remote control panel with buttons for power on and off, volume up and down, source selection, and a limited number of other functions.
4. Provide as an add-alternate, wireless presentation capability. This system will use the facility's Wi-Fi system to allow content to be shared from users' laptops, tablets, and smartphones.

M. Break Room (506)
1. Audio: Loudspeakers in the display will be used for audio reproduction
2. Video:
    a. Provide a wall-mounted display.
    b. Provide a wireless streaming device at the display.
3. Control
    a. Provide a digital signage player behind the display. It will require a data connection.
    b. Provide a pushbutton control panel to control input source and volume.
    c. The digital signs will be programmed via a computer on the ITD computer network. Software included in the digital signage package will allow content to be scheduled independently or synchronously for all displays.

N. Vault / Library Resource Center (103)
1. General
    a. No AV systems will be provided for the interior of the Vault/Library/Resource Center. The system described below will project video on the exterior of the vault as illustrated in the T-series drawings.
2. Audio
    a. No audio system will be provided
3. Video
    a. Provide a ceiling-mounted projector.
    b. Provide a video input in a wall receptacle
    c. Provide a scaling receiver at the projector.

d. Provide a digital signage player. It will receive an h.264 stream from a dedicated camera mounted on the roof, or from other streaming video sources. The camera is listed in the security equipment package.

4. Control
   a. Provide an in-wall pushbutton control panel to turn the projector on and off, switch inputs, etc.

O. Portable Systems
1. Provide a self-contained public address (PA) system for use during all-hands meetings and various other group events in areas that don't have speech amplification.

1.05 SUBMITTALS

A. Bid Submittal
1. Provide bid submittals in accordance with project Bidding Requirements, in addition to any additional requirements dictated in this section.
2. Schedule of Values: Provide a Schedule of Values for equipment to be supplied. Price each piece of equipment individually. Include required modifications and accessories in equipment costs.
3. Non-Equipment Costs: Furnish separately a list of non-equipment costs for each area, by the following categories:
4. Engineering: Including required design, drawings, run sheets, instruction manuals, etc.
5. Pre-Installation: Including fabrication, modification, assembly, rack wiring, etc., performed on the Contractor's premises.
6. Installation: Including on-site installation and wiring, coordination and supervision, testing, checkout, County training, etc., performed on the County's premises.
7. General and Administrative: Including General and Administrative expenses, shipping, insurance, and guarantees.
8. Fees: Including e-Waste disposal fees.
9. Service Contract: Submit service and maintenance costs as outlined below.
10. Alternates/substitutions: Refer to Section 27 00 00 for alternate and substitution requirements. Submit bids based on the specified equipment. Submit proposals for alternates and substitutes with associated equipment costs, separate from the costs of the equipment as specified.
11. Proposals for alternate equipment will receive consideration if the differences between the specified and alternate/substituted equipment do not depart from the overall intent of the design and operation of the system and are in the best interests of the County.
12. Include in proposals for alternate equipment, full technical information and cut sheets for the proposed equipment.
13. If the inclusion of substituted equipment will result in a different connection configuration than that in the bid documents, produce drawings that illustrate how the proposed system would be connected.

14. System Enhancements: Submit recommendations which will enhance the performance of the system, or reduce costs without loss of performance, in the bid submission. Suggestions that are of value to the County will be taken into consideration in the evaluation of the bid returns. Make such proposals as "alternates", with the appropriate cost modifications shown separate and apart from the costs of the system "as specified".
15. Required Components: Systems must be complete and fully functional. Whether these components are explicitly enumerated in this Section, audio conferencing systems must include acoustical echo cancellers per microphone unless otherwise indicated, for example. Equipment racks must include all cable management, electrical power distribution, blank and vent panels, etc.
16. Subcontract Information:
    a. Identify subcontractors and their responsibilities and qualifications in the bid submission.
    b. Because of the complexity of the systems, the supervision of such subcontracted work cannot be intermittent. Provide virtually continuous supervision of subcontractors during the installation.
17. Provide exceptions to these specifications and related drawings with the bid submission. In the absence of exceptions, these specifications and related drawings are binding in letter and intent. It will further be assumed that the bidder has examined the design and specifications in detail, and will assume full responsibility for the performance of the complete installation as designed and specified.
18. Key Personnel:
    a. Provide certification information for the Project Manager, Field Installation Supervisor and other key personnel who will be assigned to the project
    b. Indicate educational, factory and industry certifications for involved personnel
    c. Include a list of all staff that will be dedicated to the project along with their resumes and/or listing of technical qualifications.
    d. Notice of CTS Requirement: Designate a CTS–I (Certified Technology Specialist – Installation) certified employee to actively manage this project. CTS credentials will be validated at the InfoComm website.
19. Notice of DMC-E requirement for projects including Crestron DigitalMedia components: Designate a DMC-E (DigitalMedia Certified Engineer) certified employee to be actively involved in the design, implementation and commissioning of systems in this project. The validity of DMC-E credentials will be validated at the Crestron website.
20. Provide a list of any company-held certifications or designations.
21. Schedule of Implementation:
    a. Site Visit: Make a site visit before submission of bid. Include date of site visit with bid return. Coordinate site visit arrangements with the General Contractor.

b. Submit a scheduling plan with the bid return indicating the various pertinent terminal dates after award of contract for completion of design, pre-installation work, on-site installation work, and testing and acceptance.

c. Obtain projected dates when the relevant areas will be available for the on-site installation.

22. Investigate potential contract, union, and scheduling questions, and guarantee compliance with requirements and regulations in effect on the job site.
23. It is possible that certain portions of the work described herein will be ready for use prior to the completion of the entire scope of this specification. The County reserves the right to use substantially completed systems without obligation to the Contractor and without implying final acceptance of the systems or equipment so used.

B. Pre-construction Submittals
1. Product Data: Submit product information for components specified herein prior to the purchase and installation of equipment. Indicate, either on a product index sheet or directly on each product's data sheet, where this information is not already provided on the sheet, the manufacturer, model/part number, accessories and options selected, color (if applicable), and a brief product description.
2. Substitutions: Refer to Section 27 00 00 for substitution requirements. Submit requests for substitution based on the specified equipment. Submit these requests with associated equipment costs, separate from the costs of the equipment as specified.
   a. Proposals for alternate equipment will receive consideration if the differences between the specified and alternate/substituted equipment do not depart from the overall intent of the design and operation of the system and are in the best interests of the County.
   b. Include in requests for substitution, full technical information and cut sheets for the proposed equipment.
   c. If the inclusion of substituted equipment will result in a different connection configuration than that in the bid documents, produce drawings that illustrate how the proposed system would be connected.
3. Written Testing Procedures: Submit written testing procedures for initial systems testing and systems acceptance testing.

C. Shop Drawing Submittals
1. General: Submit the following in accordance with the Conditions of Contract and Division 1 Specification Section.
2. Prior to Fabrication:
   a. Panels, plates, and designation strips, including details and samples relating to terminology, engraving, finish and color
   b. Custom designed consoles, tables, carts, support bases, and shelves
   c. Schematic drawings of custom circuitry
   d. Equipment modifications

e. Touch screen menus
f. Pushbutton control panel layouts including the labels for all buttons
g. Handheld remote control panel layouts including the labels for all buttons
h. Audio processor configuration files. It is understood that these files will be modified during system commissioning, but basic routing and processing must be complete and submitted prior to system fabrication.

3. Prior to Assembly and Installation:
   a. Provide system functional line drawings for all systems. Include equipment names and model numbers (e.g., "Program Amplifier - Crown CT-400"). Clearly label each item of equipment shown on the drawing with the manufacturer's terminal number or input/output designation (e.g., "Mic 1-In", or "Record Out-Left").
   b. Provide equipment rack elevation and patch panel assignment drawings. Provide labeling on the functional diagrams, rack elevations, patch panels, and on the equipment controls that is consistent and uniform.
   c. Provide full-scale drawings of custom plates and panels indicating exact lettering, critical dimensions, and finishes.
   d. Provide cable run lists. Clearly show at each terminal point the type of connector to be used. Include typical wiring details of each connector. Note where shields are connected and where they will float to ensure the integrity of the grounding system. Indicate cable types and, where appropriate, color codes. Assign wire numbers and patch bay locations to every wire and patch point in the drawing.
   e. Equipment modification drawings: Include details of modifications that change or void manufacturers' warranties.
   f. Provide schematic drawings of custom circuitry. Include receptacle pin numbers and component callouts. Show details of custom resistive attenuation and/or combining networks, filters, or pads which may be required in the assembly. Show point-to-point wiring drawings for control system modules and interfaces, and for switches and relays in audio, video, or control systems.
   g. Submit written testing procedures to be performed during pre-testing and acceptance testing. Provide for each test item the minimum acceptable outcome for that test.
   h. Provide a list of test equipment, including manufacturer, description and model number, of equipment that will be employed in the testing and adjustment of the installed systems.
   i. List equipment which is to be connected to the building or campus computer network. Provide an Excel spreadsheet listing each piece of equipment.
      1) Indicate which equipment, if any requires static addressing.
      2) Indicate which equipment requires specific network and/or subnet configuration.
      3) Indicate equipment which is likely to generate a high volume of network traffic.

4) Indicate equipment with particular QOS requirements.

j. Provide a full-scale mockup of the recognition plates as described in the "Installation" section.

D. Prior to Acceptance Testing:

1. Submit the Initial Testing and Tuning Report showing procedures and results for tests performed. Provide the names of specific automated tests performed via testing tools or installed AV equipment.
2. Provide reports generated by automated tests using both standalone testing equipment and programs running on installed AV equipment.
3. Provide a list of the test equipment used for these tests.
4. Coordinate with the County to obtain a sample of the laptop computers and other portable devices, including any types of tablets and smartphones used for presentation. Confirm presentation systems are compatible with these devices.

E. At the Completion of the Installation:

1. Provide written notification to the County and Architect when initial checkout is complete, normal settings are documented, as-built and operational documentation are complete, and systems are available for final acceptance tests. Provide a completed copy of the initial testing report in accordance with Part 3. Acceptance testing will follow the submission of the initial testing report.
2. Submit equipment manufacturers' operation and maintenance manuals for each piece of equipment.
3. Submit "as-built" drawings for systems and items indicated as "Custom".
4. Submit a copy of control system programming, including touch screen layouts, capable of being revised and compiled.
5. System Operation and Maintenance Manual:
   a. Describe in the "Operation" section, typical procedures necessary to activate each system to provide for the functional requirements as listed under the System Description. Include normal settings for equalizer, amplifier, signal processing, and user-operated controls (as established during system check-out) in tabular or pictorial form.
   b. Provide in the "Maintenance" section, a recommended maintenance schedule with reference to the applicable pages in the manufacturer's maintenance manuals. Where inadequate information is provided by the manufacturer, provide the information necessary for proper maintenance.
   c. Provide a list of necessary and recommended replacement parts for a normal maintenance period of one year.
   d. Assume the reader of this manual to be technically competent, but unfamiliar with this particular facility. It is estimated that this manual should require a minimum of 15 pages.
6. Provide a copy of control system software created for this project on CD-R discs including modifiable and clearly commented code capable of being compiled.
7. Provide a copy of audio processor configuration files created for this project on CD-R disks.

1.06 PROJECT MANAGEMENT AND COORDINATION

A. Provide a project manager for the duration of the project to coordinate this Work with other trades. Coordination services, procedures and documentation responsibility include, but are not limited to, the items listed in this section.

B. Prepare and maintain a shop drawing review log indicating the following information:
1. The shop drawing number and a brief description of the system/material
2. The date of the review
3. The name of the individual performing the review
4. An indication whether follow-up coordination is required

1.07 DRAWINGS

A. Layout: Follow the general layout shown on the AV/Technology Drawings except where other Work may conflict with these drawings.

B. Accuracy: Drawings for the Work within this Division are essentially diagrammatic within the constraints of the symbology applied.

C. The Drawings do not fully represent the entire installation for the audiovisual systems. In particular, the functional/single-line drawings indicate the design intent.

D. Complete the details necessary for detailed system design and document this work in shop drawings.

1.08 PERFORMANCE STANDARDS

A. Meet the following performance standards with each system, unless restricted by the published specifications of a particular piece of equipment. Notify the Design Consultant of any restrictions.

B. ADA Compliance:
1. Display systems must meet ADA requirements for the display of closed captioning content.
2. Control systems must meet ADA requirements for accessibility.
3. Audio systems must meet ADA assistive listening system requirements.

C. Audio System:
1. Program Audio System:
    a. Frequency Response: ± 3 dB per octave band, 100 Hz to 12,000 Hz. 3dB per octave roll off below 100Hz and above 12 kHz.
    b. Total Acoustical Harmonic Distortion: Less than 2% at 90 dBC (1kHz reference) at four feet (1,220mm) above finished floor in the middle of the room.
2. Distributed Audio System:

a. Frequency Response: ± 3 dB per octave band, 125 Hz to 10,000 Hz. 3dB per octave roll off below 125 Hz and above 10 kHz.

b. Total Acoustical Harmonic Distortion: Less than 2% at 85 dBC (1kHz reference) at four feet (1,220mm) above finished floor in the middle of the room.

3. Adjust the gain structure for all audio system components (mixer input to amplifier output) to achieve the highest signal-to-noise ratio, 75 dB from 50 Hz to 15 kHz minimum.
4. Ensure that the audio frequency response of the electronics system with equalizers bypassed varies less than ±1 dB from 50 Hz to 12 kHz.
5. The electronic system audio distortion shall be less than 0.5% at 1 kHz at the equipment's rated input signal level.
6. Sound Output Capability: Provide program levels of not less than 95 dB and speech reinforcement levels of not less than 85dB in the seating area without objectionable distortion, rattles, or buzzes, employing as test signals several different samples of recorded music and microphones applied at each system input.
7. Hum and Noise: Hum and noise shall be inaudible (below the background noise level of the space) under normal operation and as observed in normal seat locations.

D. Projection Systems:
1. Image size and clarity: Mount the video projector as indicated on the drawings and project the image onto the projection screen. Projected images shall be of maximum width and maximum height, centered on screen. Image tests shall utilize standard AMI test slides and similar video media to establish any image sizes on the screen.
2. Geometric Distortion: Corrected geometric distortion using physical and/or optical adjustments only. Only use electronic or digital correction when these are called for by the design intent.
3. The total averaged light output from a projector, in lumens, shall be ± 15% of that specified by the projector manufacturer.
4. The light falloff from the center of the projected image to four corners, as measured at the projected image plane, shall not exceed 50% for video projector images or 35% for slide projector images.
5. Securely mount and brace projectors, lenses, and mirrors so there will be no observable movement in the image induced by motor vibration or other mechanical operations.

E. Control:
1. Provide IP-controlled power control interfaces to devices not provided with these, whether power control accessories are listed in this Section or not. Verify functional operation for specified control operations.
2. Illuminated feedback of the active function via illuminated or shaded pushbutton at operator and wired remote control stations.

3. Wireless systems shall neither be the source of, nor be affected by, radio frequency interference to/from external signal devices.
4. Take ergonomics into account when designing user interfaces. Be aware that the level of technical inclination will vary between users. Follow these guidelines:
5. Graphics:
    a. Avoid abbreviations
    b. Size lettering at 1/8" minimum
    c. Maintain background to lettering contrast
6. Positive logic: Avoid conditions which may cause command synchronization conflicts (i.e., alternate action (toggling) on/off without power reset of feedback. Provide power sensors or other devices where necessary to ensure that positive logic conditions are maintained.
7. Timing: Timing: Prevent two or more commands being sent simultaneously to the same piece of equipment.
8. Linking: Provide linking of functions to require the fewest number of user actions to effectively control the equipment.
9. Clearing: Ensure that each media selection clears the previous audio and visual selection (i.e. Selecting COMPUTER clears the audio as well as video section of the previous Blu-ray disk selection.
10. Defaults: Establish default power-up conditions for the system including device audio levels, warm-up routine, power conditions, switcher status and other default conditions as required by the County or County's representative.
11. Volume Memory: Provide easy-to-use memory for volume settings associated with each particular source device. These settings shall be maintained between alternate selections during each use – from power on to power off.
12. Status Indication: Buttons (hard and soft) which incorporate indicator light or inverted illumination capabilities shall be addressed through the software and programming.
13. Failsafe: No operation or sequence of operations shall cause the control system to become inoperable or interfere with further processing, correct operations or execution of commands.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of Section 270000. In addition, comply with the following requirements.

1.10 WARRANTY

A. Warrant the system for a minimum of one year from the date of system acceptance by the County. Honor component warranties per manufacturers' terms if greater than one year. Provide quarterly site visits to check and adjust equipment and restore systems to original performance.

B. Activate manufacturers' equipment warranties in the County's name to commence on the date of acceptance. In the case of Contractor-modified equipment, the

manufacturer's warranty is normally voided. In such cases, provide the County with a warranty equivalent to that of the original manufacturer.

1.11 SOFTWARE LICENSE

A. Nondisclosure

1. In consideration of the disclosure to the County of information relating to all technical aspects of the Deliverables and other proprietary products, technology and/or processes of the AV Contractor, including, but not limited to, drawings, models, photographs, sketches and microfiche, the County agrees:
   a. To maintain such information (including all portions or copies thereof) confidential in the same manner as its own County proprietary information is maintained,
   b. Not to disclose the information (or any portion or copy thereof) to any third party,
   c. Not to use such information (or any portion or copy thereof) for any purpose except maintenance and support of its in-house systems.
   d. The obligations of this Agreement shall not apply to any information which is or which becomes generally known to the public due to publication or by means other than a breach of duty by the County or which becomes otherwise available to the County through legal sources.

B. Obligations Governing the Software

1. Title to and exclusive Countyship of the Software as licensed hereunder shall at all times remain with the AV Contractor or third party suppliers but the AV Contractor hereby grants to the County, or has obtained for the County from third party suppliers, successive irrevocable, royalty-free, non-transferable and non-exclusive licenses to use the Software as licensed hereunder from the date of this Agreement in perpetuity.
2. The County shall have no right to sublicense or part with possession of such Software as licensed hereunder or any part thereof to third parties.
3. The original and all copies of the Software as well as any updates which may be purchased by subsequent agreement shall be and remain the property of the AV Contractor. Title to all applicable rights in patents, copyrights, and trade secrets in the Software will remain with the AV Contractor.
4. The foregoing licenses shall extend to all equipment purchased or utilized by the County.
5. Notwithstanding anything to the contrary elsewhere herein, at no time shall the AV Contractor or third party suppliers be precluded or restricted from selling or licensing Software as licensed hereunder identical to the Software as licensed hereunder or any part thereof to other customers.
6. Software as licensed hereunder which is the property of any third party will be assumed to have been licensed by its proprietor to the AV Contractor and such Software as licensed hereunder shall be directly licensed by its proprietor or sublicensed to the County with the consent of the proprietor at no cost to the

County on the same terms and Clauses as are contained in this Agreement in respect to the AV Contractor's own Software as licensed hereunder.

7. The AV contractor shall provide the software required for the system to function as indicated in the contract documents.
8. At the time of submitting the System to the Acceptance Tests, the AV Contractor will supply where applicable and having used its best efforts in the case of third party suppliers (best efforts will be demonstrated to the County by copies of correspondence between the AV Contractor and the third party stating the AV Contractor's request and giving the third party statement of compliance or otherwise) to the County media which will contain:
    a. All source code pertaining to the System
    b. Instructions and full description of equipment required which will enable the County to create executable programs from source code
    c. All executable programs
    d. Instructions and full description of equipment required which will enable the County to prepare operating systems and other third party Software as licensed hereunder for use
9. For any Software as licensed hereunder not developed by the AV Contractor all information, data, codes and documentation distributed to the AV Contractor and otherwise available to the audiovisual system.
10. The above so submitted Software as licensed hereunder shall be in a form suitable for immediate access by the System.
11. In the event that the AV Contractor is unable to supply the source code pertaining to the System the AV Contractor warrants, and the County accepts, that at all times the latest version of the source code from the AV Contractor or any third party supplier has been deposited, at even date of this Agreement, and is available for inspection by the County during normal business hours at any time. The AV Contractor further warrants that the Independent Source Code Depository has been instructed and has acknowledged that the deposited source code will be released to the County upon insolvency of the AV Contractor.
12. If the County discovers an error in the coding or the logic of the Software as licensed hereunder and as supplied under the terms of this Agreement to the County, which prevents the System from performing in accordance with the performance requirements of this Agreement, the County shall notify the AV Contractor of the error and upon request by the AV Contractor will deliver to the AV Contractor its analysis thereof accompanied by complete program, module, data listings and sample runs exhibiting and rectifying the error.
13. The AV Contractor shall from time to time notify the County of the availability of newer versions of the supplied Software as licensed hereunder which the AV Contractor or any third party supplier has released for use by its customers generally and shall, within sixty (60) days of receipt of written request by the County, supply such newer version to the County. Any such Software as licensed hereunder provided must be documented as to:
    a. The fault being corrected (if any)

b. The enhancement it represents

c. The restrictions imposed or removed

d. The details of modifications to and differences from the version to be replaced

14. The County shall assist the AV Contractor in its performance under the terms of this Agreement by allowing the AV Contractor to use the County's System, data listings and sample runs to reproduce and/or correct the reported error and to install and check updated versions of the delivered Software licensed hereunder.
15. The AV Contractor represents and warrants that it is the County or Licensee of the supplied Software as licensed hereunder and has the right to permit the County to use the same. The AV Contractor shall not be liable for any incidental or consequential damages, whether foreseeable or not, even if the AV Contractor has been advised of the possibility of such damages, resulting from or in any way connected with the use of the supplied Software as licensed hereunder.
16. The AV Contractor shall defend any suit or proceeding brought against the County and shall pay any adverse judgment entered therein so far as such suit or proceeding is based upon a claim that the use of the Software as licensed hereunder furnished by the AV Contractor under this Agreement constitutes infringement of any copyright or patent, provided the AV Contractor is promptly notified in writing and given authority, information and assistance (at the AV Contractor's expense) for the defense of same; and the AV Contractor shall, at its own expense and at its option, procure for the County the right to continue to use the said Software as licensed hereunder, or to replace the same with a non-infringing release. The foregoing shall not be construed to include any agreement by the AV Contractor to accept any liability whatsoever in respect to copyrights or patents for inventions including more than the Software as licensed and furnished hereunder, or in respect of copyrights or patents for methods and processes to be carried out with the aid of said Software as licensed hereunder, except those which are inherent in said System as furnished. The foregoing states the entire liability of the AV Contractor with regard to copyright and patent infringement as related to the delivered Software as licensed hereunder.
17. The County acknowledges the rights of the AV Contractor and third party suppliers in and to the Software as licensed hereunder, including, but not limited to, computer programs, user manuals, other supporting material and data, identifying symbols, passwords, user numbers and security symbols, and further acknowledges that such are properly considered to be trade secrets in that they involve processes and compilation of the information which are secret, confidential and not generally known to the public, and which are the product of the AV Contractor's own expenditure of time, effort, money and creative skills. The County also acknowledges and agrees that the use of the Software as licensed hereunder is on a confidential basis for the sole and exclusive use by the County and not for resale, and agrees that it will not use, publish disclose or otherwise divulge to any person, except necessary employees of the County, at any time, either during or after the termination of this Agreement, nor permit its employees to so divulge any such information regarding the software as licensed hereunder, without the prior written consent of an officer of the AV Contractor, except that

the County is authorized hereby to reproduce information derived from the software as licensed hereunder for its own internal use by authorized employees. Notwithstanding the foregoing, the proprietary and secret information covered hereby may be disclosed by the County to a third party, person, firm or corporation if such disclosure is unavoidable because of its or their access to or control of the County's computers, provided that this sentence shall not be deemed to permit any use of the Software as licensed hereunder which would otherwise be prohibited. Nothing herein shall be deemed to limit any rights of the AV Contractor under copyright, patent or other law.

18. The County shall use the Software as licensed hereunder solely and exclusively for its own purposes and shall not, without the prior written approval of the AV Contractor, allow any third party to use the Software as licensed hereunder for purposes of any such third party whether or not the County is compensated therefore.
19. The AV Contractor warrants that a copy of the current and previous version of Software as licensed hereunder submitted to the County is available from the AV Contractor.
20. The County warrants that all Software used for the duration of the warranty period is the Software as licensed hereunder and released from time to time by the AV Contractor to the County. Failure by the County to use the Software as licensed hereunder and released by the AV Contractor will constitute the conclusion of the warranty period as defined under the terms of this Agreement.
21. Any new version of Software as licensed hereunder and delivered to the County by the AV Contractor during the warranty period, under the terms of this Agreement which is deemed, and advised so by the AV Contractor, to rectify a failure which occurred during the operations of an event, will cause the warranty period for the Software as licensed hereunder to restart.
22. The AV Contractor hereby warrants the right by the County to any corrective Software updates for the next ten (10) years.
23. The AV Contractor restricts any enhancements to Software as licensed hereunder to the latest release of Software as licensed hereunder only.
24. The AV Contractor warrants that all contracts, contacts and arrangements between the AV Contractor and all third party Software suppliers providing Software as licensed hereunder will transfer to the County with the successful completion of the Final Acceptance.
25. The County warrants to inform the AV Contractor of all its dealings with third party Software suppliers supplying software as licensed hereunder for the duration of the warranty period.
26. The AV Contractor warrants that at no charge to the County it will reply to queries from the County, provided that:
    a. The queries relate to the System provided by the AV Contractor pursuant to this Purchase Agreement
    b. The query is raised by County staff or an authorized agent of the County
    c. The query is during the AV Contractor's normal business hours

d. The County's representative or employee has attended standard basic training in the use of the System as provided by the AV Contractor

e. The County warrants that the use of this service is not intended as a vehicle for design consultation.

27. The County may make copies of the Software in any machine-readable form for backup purpose only. Any such copies made by the County will include the AV Contractor's copyright notice, together with any other proprietary notices. The County will take all reasonable steps to ensure that the whole or any part of the Software is not reproduced or copied (save as aforesaid) by any employee, licensee, invitee or agent of the County or any other person under the control of the County and shall observe all reasonable security in relation to the storage, filing and use of the Software and basic materials. The County shall not sell, lease, rent, assign, transfer, deliver or otherwise part with possession of the licensed Software or permit any other person, firm or company to inspect or use the Software in any way provided that the external auditors formally appointed by the County shall have the power to inspect and have access to the Software held on County premises at any time.
28. The County acknowledges that in acquiring the right to use the Software it has relied upon its own skill and judgment in the selection thereof and in the use and result it intends to obtain therefore.

C. Software License Terms

1. The AV Contractor warrants that it has the right to grant this Software License(s) for the use of the Software and that the Licenses for Software supplied pursuant to this Purchase Agreement authorize the County to use the licensed Software in machine readable form on the processing devices which form part of the County's computer processing facilities so designated by make and model in respect of which this License is granted. If the designated processor is inoperative for any reason, any License granted under this Agreement shall be extended to authorize the use of the licensed Software on a backup processing unit until the designated processor is available again. If a designated processor is to be permanently phased-out of operation and replaced by another processor, this License may be transferred to a replacement processor at no costs or liability to the AV Contractor upon written notification to the AV Contractor of the new processor make and model. For the purpose of this Agreement, use is defined as copying for processing any portion of the instructions or data in any licensed software from storage units or media into the designated processor, to the extent authorized above, into another processing unit in the event of malfunction.
2. Any additional licenses for Software and/or modifications, alterations and amendments to the licensed Software granted to the County by the AV Contractor shall be subject to:

   a. The terms of any supplemental agreement between the parties, and the conditions of this Agreement insofar as they do not conflict with the terms of the supplemental agreement.

PART 2 - PRODUCTS

2.01 SUPPLIER/INSTALLERS

A. General Qualifications:

1. Firm has been in business providing similar service required by this section for not less than five years.
2. Firm can outline the general scope of past projects, normal staffing levels, and union status of shop and field installation personnel.
3. Firm can list a minimum of three projects of similar scope successfully completed in the past 24 months, indicating the location, type of system installed, total contract amount, date completed, and include persons and telephone number to contact.
4. Firm can submit confirmation of current state or local contracting licenses, as required to perform the work under this section.
5. Firm shall be an authorized supplier and installer for all equipment.

B. Subcontract:

1. No subcontract will be permitted, unless specifically identified in the bid submission.
2. The Audiovisual Contractor shall have sole responsibility for the satisfactory implementation of the work in this section, regardless of any subcontract arrangement.

2.02 EQUIPMENT

A. Each product and piece of equipment shall be the latest version of the specified model or type available at the time of procurement, providing the updated devices provide the same or better capabilities and performance required by the system design.

2.03 CUSTOM FABRICATION

A. Remote Control Panels and Interface Plates. Fabricate with 1/8 inch (3mm) thick #6061-T6 aluminum material. Finish brushed with 150 grit paper. Anodized finish to be black or as approved by the Architect.

B. Equipment Rack: Provide power receptacle strips, with "U" ground outlets. Power receptacle strips shall be mounted on the rear interior of the rack space on the left side as viewed from the rear. Insulate power receptacle strips from the rack. Power receptacle strips shall be Middle Atlantic or approved equal. Provide UL-approved LED work lights magnetically attached on the upper left interior panel of each rack space.

C. Audio Transformers: Provide appropriate impedance ratio and power handling capacity for the function intended of audio transformers specified in the system.

D. Networks and Pads: Provide networks and pads as shown on the drawings or as required to achieve proper impedance matching and levels. Networks and pads shall be balanced. 0.5 watt, 5% composition resistors shall be soldered to fixed connection points at each end.

E. Loudspeaker Niches: Loosely fill with glass fiber to 2 lbs./cu. ft. density prior to installing loudspeakers.

F. Labeling: Provide permanently mounted 1/32" thick by 1/4" high black engraved or anodized, brushed aluminum labels with 1/8" engraved lettering for each piece of equipment and every user-adjustable control and input on the audiovisual equipment. Provide 3/8” to 1/2” high permanent labels on the back of each piece of equipment. Label should be white with black lettering. Label adhesive must be permanent.

G. If the serial number of a piece of rack-mounted equipment is not visible on the rear panel, provide a visible, permanently-attached label on the equipment, duplicating the serial number.

H. Rack Shelves/Mount Adapters: Provide the appropriate factory or custom rack shelves/mount adapters for equipment installed in the audiovisual equipment rack, whether specifically itemized or not. Acceptable manufacturers for custom rack adapters: Middle Atlantic, Winsted, APC/Stantron.

I. Provide security covers or shaft locks for all level controls, as appropriate, on all equalizers, crossovers, signal delays, and other adjustable signal processors.

J. System Functional Diagrams: Provide reduced-size as-built functional diagram for the control, audio and video system. Frame with acrylic cover, or laminate drawing, and mount adjacent to equipment rack.

K. Seismic Safety: Mount and brace permanently-installed equipment to the building structure per the most stringent of applicable codes and regulations to minimize potential damage to personnel or equipment from foreseeable seismic events. Bolt audiovisual equipment racks to the floor to prevent toppling. Brace hanging audiovisual and associated equipment both to minimize sway and to prevent detachment from the overhead structure.

2.04 EQUIPMENT SCHEDULE

A. Note on substitutions: Most of the equipment in this list is substitutable. Substitutions will be considered if the functional requirements in the System Description are met and the proposed products provide equal or better capabilities and performance compared to the items referred to below.

B. Collaboration Areas /Open Huddles

Description	**Manufacturer**	**Model**	**Qty.**	**Comments**
Video				
Display	Samsung	QM55F	A/S	
Wall mount	Samsung	WMN4270SD	A/R	
Floor stand	Peerless	SS560F	1	Freestanding location only
Source Equipment				
Wireless presentation device	Mersive	Solstice Pod SGE	A/S	
Pod Mount	HIDEit	Uni-XS	A/R	
Add Alternate				
Upgrade Solstice Pod SGE to Unlimited	Mersive	Solstice Pod Unlimited	A/S	

C. Small Conference (111, 127, 306, 417)

Description	**Manufacturer**	**Model**	**Qty.**	**Comments**
Audio				
Speakerphone				Provided in telephone package – shown for coordination
Video				
Display (111, 417)	Samsung	QM49F	A/S	49”
Mount (111, 417)	Samsung	WMN4270SD	A/R	
Display (127, 306)	Samsung	DM32E	A/S	32”
Mount (127, 306)	Chief	Both FSB4041 and	A/R	

		FSB4100		
Description	**Manufacturer**	**Model**	**Qty.**	**Comments**
Source Equipment				
Wireless presentation device	Mersive	Solstice Pod SGE	A/S	
Pod Mount	HIDEit	Uni-XS	A/R	
USB Bridge	Extron	MediaPort 200	A/S	
Camera	Panasonic	AW-HE2P	A/S	
Camera Mount	Panasonic	FEC-20WM	A/R	
Camera Extender	Crestron	HD-EXT3-C	A/R	
Laptop Input Device Transmitter	Crestron	DM-TX-4K-100-C-1G	A/R	HDMI only
Scaling Receiver	Crestron	DM-RMC-SCALER-C	A/R	
USB Transmitter Wall plate	Extron	USB EXTENDER D TX	A/R	
USB Receiver plate	Extron	USB EXTENDER D RX	A/R	
Control				
Touch panel	Crestron	TSW-752	A/S	
Control processor	Crestron	RMC3	A/S	
Misc.				
Equipment Rack	Middle Atlantic	Slim 5-14	A/R	In credenza
Add Alternate				
Upgrade Solstice Pod SGE to Unlimited	Mersive	Solstice Pod Unlimited	A/S	

Small Conference (420)

Description	**Manufacturer**	**Model**	**Qty.**	**Comments**
Audio				
Tabletop microphone	Shure	MXA310B	A/S	
Ceiling loudspeaker	QSC	AD-C6T-WH	A/S	
Audio processor	Extron	DMP 128 C AT	A/S	
Amplifier	QSC	SPA 4-60	A/S	
Video				
Display	Samsung	QM49F	A/S	49”
Mount	Samsung	WMN4270SD	A/R	
Video Matrix/Controller	Crestron	DMPS3-200-C	A/S	
Source Equipment				
HDMI transmitter	Crestron	DM-TX-4K-100-C-1G	A/S	
Scaling Receiver	Crestron	DM-RMC-SCALER-C	A/S	
Description	**Manufacturer**	**Model**	**Qty.**	**Comments**

Wireless presentation device	Mersive	Solstice Pod SGE	A/S	
Pod Mount	HIDEit	Uni-XS	A/R	
USB Bridge	Extron	MediaPort 200	A/S	
Camera	Panasonic	AW-HE2P		
Camera Mount	Panasonic	FEC-20WM		
Control				
Touch panel	Crestron	TSW-1052	A/S	
Miscellaneous				
Tabletop cable cubby	Extron	Cable Cubby 700	A/S	Coordinate finish with architect
Misc.				
Equipment rack	Middle Atlantic	Slim 5-14	A/R	In credenza
Add Alternate				
Upgrade Solstice Pod SGE to Unlimited	Mersive	Solstice Pod Unlimited	A/S	

D. Large Team Conference (114, 205)

Description	**Manufacturer**	**Model**	**Qty.**	**Comments**
Audio				
Tabletop microphone	Shure	MX395B/C-LED	A/S	Coordinate finish with architect
Tabletop microphone	Shure	MX395B/BI-LED	A/S	Coordinate finish with architect
Ceiling loudspeaker	QSC	AD-C6T-WH	A/S	
Audio processor	QSC	Core 110f	A/S	
Amplifier	QSC	SPA 4-60	A/S	
Video				
Display	Samsung	DM55E	A/S	55”
Mount	Chief	LSM1U	A/R	
Source Equipment				
Wireless presentation device	Mersive	Solstice Pod SGE	A/S	
Pod Mount	HIDEit	Uni-XS	A/R	
Laptop input device/transmitter	Crestron	HD-MD-400-C-E	A/S	
Camera	Panasonic	AW-HE2P	A/S	
Wall mount	Panasonic	FEC-20WM	A/S	
USB bridge	Extron	MediaPort 200	A/S	
Control				
Touch panel	Crestron	TSW-1052	A/S	
Control processor	Crestron	RMC3	A/S	

Misc.				
Tabletop cable cubby	Extron	Cable Cubby 700	A/S	Coordinate finish with architect
Input Wall Plate, Receiver	Crestron	HD-EXT3-C	1	
USB Transmitter Wall plate	Extron	USB EXTENDER D TX	A/R	
USB Receiver Wall plate	Extron	USB EXTENDER D RX	A/R	
Equipment Rack	Middle Atlantic	Slim 5-14	A/R	In credenza
Add Alternate				
Upgrade Solstice Pod SGE to Unlimited	Mersive	Solstice Pod Unlimited	A/S	

E. Large Conference (228)

Description	**Manufacturer**	**Model**	**Qty.**	**Comments**
Audio				
Tabletop microphone	Shure	MXA395B/C-LED	A/S	Coordinate finish with architect
Ceiling loudspeaker	QSC	AD-C6T-WH	A/S	
Audio processor	QSC	Core 110f	A/S	
Video				
Display	Samsung	ME95C	A/S	
Mount	Chief	XSM1U	A/R	
Source Equipment				
Wireless presentation device	Mersive	Solstice Pod SGE	A/S	
Pod Mount	HIDEit	Uni-XS	A/R	
Camera	PTZOptics	PT20X-SDI-WH-G2	A/S	White
USB bridge	Extron	MediaPort 200	A/S	
Control				
Touch panel	Crestron	TSW-1052	A/S	
Misc.				
Equipment rack	Middle Atlantic	Slim 5-14	A/R	Credenza
Video Matrix/Processor	Crestron	DMPS3-300-C	A/S	
Input Wall plate, Transmitter	Crestron	DM-TX-4K-100-C-1G	1	
Camera Extenders	Crestron	HD-EXT3-C	2	
Scaling Receiver	Crestron	DM-RMC-SCALER-C	1	
USB Transmitter Wall plate	Extron	USB EXTENDER D TX	A/R	

USB Receiver Wall plate	Extron	USB EXTENDER D RX	A/R	
Add Alternate 1				
Streaming Device	Extron	SME 100	A/S	
Add Alternate 2				
Streaming Device	Extron	SMP 351		Should this alternate be selected, provide this item in lieu of Add Alternate 1.
Add Alternate 3				
Upgrade Solstice Pod SGE to Unlimited	Mersive	Solstice Pod Unlimited	A/S	

F. Training Room (215)

Description	**Manufacturer**	**Model**	**Qty.**	**Comments**
Audio				
Wireless lavalier microphone	Shure	ULXS14/85	2	
Overhead microphone	Shure	MXA910	A/S	
Ceiling loudspeaker	QSC	AD-C6T	A/S	
Audio processor	QSC	Core 500i w/Dante Card	A/S	
Dante Module	QSC	CDN64	A/R	
Analog Input Module	QSC	CIML4	A/R	
Analog Output Module	QSC	COL4	A/R	
Network Switch	TP Link	TL-SG2424P	1	
Amplifier	QSC	SPA 4-60	A/S	
Video				
Projector	NEC	NP-P502HL	A/S	
Mount	Chief	SYSAUWP2	A/R	
Source Equipment				
Wireless presentation device	Mersive	Solstice Pod SGE	A/S	
Pod Mount	HIDEit	Uni-XS	A/R	
Video camera	PTZOptics	PT20X-SDI-WH-G2	A/S	Coordinate with architect.
Video Extender	Crestron	HD-EXT3-C	A/S	
USB bridge	Extron	MediaPort 200	A/S	
Streaming Media Encoder	Extron	SMP 351	A/S	
Control				
Touch panel	Crestron	TSW-1052	A/S	

Description	Manufacturer	Model	Qty.	Comments
Matrix Switch, Control Processor	Crestron	DMPS3-300-C	A/S	
Misc.				
Equipment rack	Middle Atlantic	Slim 5-14	A/R	Credenza
Input Wall plate, Transmitter	Crestron	DM-TX-4K-100-C-1G	2	
Scaling Receiver	Crestron	DM-RMC-SCALER-C	A/S	
USB Transmitter Wall plate	Extron	USB EXTENDER D TX	A/R	
USB Receiver Wall plate	Extron	USB EXTENDER D RX	A/R	
Assistive listening modulator	Williams Sound	MOD 232	1	Part of WIR SYS 1
Assistive listening emitter	Williams Sound	WIR TX9	1	Part of WIR SYS 1
Assistive listening receiver	Williams Sound	WIR RX22-4	2	Part of WIR SYS 1
Assistive listening loop	Williams Sound		2	Part of WIR SYS 1
Assistive listening charger	Williams Sound		1	Part of WIR SYS 1
Additive Alternate 1				
Lecture capture device	Extron	SMP 351	A/S	Increased Storage Capacity
Add Alternate				
Upgrade Solstice Pod SGE to Unlimited	Mersive	Solstice Pod Unlimited	A/S	

G. Stadium Conference (217)

Description	Manufacturer	Model	Qty.	Comments
Audio				
Wireless lavalier mic	Shure	ULXS14/85	A/S	
Display-attached loudspeaker (pair)	Innovox	FF-V2.6	A/S	Use powered version
Audio processor	QSC	Core 110f	A/S	
Extron	HAE 100	HDMI De-Embedder	A/S	
Video				
Display	Samsung	DM65E	A/S	65”
Mount	Chief	TPPU	A/S	Tilt truss mount
Wireless presentation device	Mersive	Solstice Pod SGE	A/S	

Mount for Above	HIDEit	Uni-XS	1	
Control				
Integrated pushbutton control panel/controller	Crestron	MPC-M10	A/S	
Misc.				
Equipment rack	Middle Atlantic	Slim 5-14	A/R	In Credenza
Add Alternate				
Upgrade Solstice Pod SGE to Unlimited	Mersive	Solstice Pod Unlimited	A/S	

H. Reception Area

Description	**Manufacturer**	**Model**	**Qty.**	**Comments**
Audio				
See Portable Audio Systems, below				
Video				
Display	Samsung	DM55E	A/S	55”
Mount	Chief	PCS2000B	A/S	Note: ceiling support from metal frame
Interface Bracket	Chief	PSBUB	A/S	
Extension Column	Chief	As required	A/S	Coordinate with GC for required extension
Rear shroud	Chief	PAC230B PSB2306	A/S	Note: metal cover for rear of display
Digital signage player	Brightsign	XD1033	A/S	

I. Offices (415, 419, 421)

Description	**Manufacturer**	**Model**	**Qty.**	**Comments**
Video				
Laptop transmitter	Crestron	HD-MD-400-C-E	A/R	
Display	Samsung	UE46D	A/S	46”
Mount	Chief	LSM1U	A/S	
Control				
Pushbutton control panel	Crestron	MPC-M5-B-T	A/S	
Description	**Manufacturer**	**Model**	**Qty.**	**Comments**
Misc.				
Wall Plate	Crestron	MP-WP152	A/R	HDMI Only
Add Alternate				
Wireless presentation device	Mersive	Solstice Pod SGE	A/S	
Mount for Above	HIDEit	Uni-XS	1	

J. Digital Signage

Description	Manufacturer	Model	Qty.	Comments
Break Room (506)				
Display	Samsung	UE46D	A/S	46”
Mount	Chief	LSM1U	A/S	
Digital Signage Player	Brightsign	XD1033	1	
Wireless Presentation Device	Mersive	Solstice Pod SGE	1	
Mount for Above	**HIDEit**	**Uni-XS**	**1**	
Pushbutton control panel	Crestron	MPC-M5-B-T	A/S	

K. Vault

Description	Manufacturer	Model	Qty.	Comments
Video				
Projector	NEC	NP-P502WL	A/S	Maximum noise: 39 dB in Normal mode, 33 dB in Eco
Mount	Chief	SYSAUWP2	A/R	
Digital signage player	Brightsign	XD1033	1	
Control				
Pushbutton Control Panel	Crestron	MPC-M5-B-T	A/S	
Misc.				
Input Wall Plate	Crestron	DM-TX-200-C-2G	1	

L. Portable Audio Systems

Description	Manufacturer	Model	Qty.	Comments
Portable PA system	Fender	Passport VENUE	1	
Wireless lavalier mic	Shure	ULXS14/85	A/S	

2.05 CABLING

A. For HDBaseT systems, use the extender system manufacturer’s recommended cable type for the specific system and the cable run length to be used.

B. Manufacturers:
1. Extron
2. Liberty
3. Belden
4. Canare
5. West Penn
6. Or equal

C. The following cable manufacturers and types are listed as a reference to establish performance. Any of the equal manufacturers' products can be used:

1. Audio Cable:
   a. Microphone, 4-conductor star quad, low impedance: Belden #1172A
   b. Microphone, single-pair cable: Belden #1800F
   c. Line level, single-pair cable: Belden #9451
   d. Microphone and line level, single-pair, plenum-rated cable: Belden #9451P
   e. Digital audio, multi-conductor, stranded, AES/EBU cable: Belden #1350SB
   f. Digital optical TOSLINK cable: TrippLite A102-Series
   g. Digital coaxial, low-loss serial cable: Belden #1694A
2. Program Loudspeaker Cable:
   a. Low impedance, multi-conductor cable: Belden 5000UE-Series
   b. Low impedance, multi-conductor, plenum-rated cable: Belden 6000UE-Series
   c. High impedance, 70V / 100V, multi-conductor, shielded, plenum-rated cable: Belden 5000FE-Series
   d. High impedance, 70V / 100V, multi-conductor, shielded cable: Belden 6000FE-Series
3. Video HD-SDI, SDI, RGBHV, RGB, Y/C, Component, Composite Cable:
   a. Coax, RG-59/U type cable: Belden #1505A
   b. Coax, RG-59/U type, plenum-rated cable: Belden #1506A
   c. Coax, RG-6/U type cable: Belden #1694A
   d. Coax, RG-6/U type, plenum rated cable: Belden #1695A
   e. Coax, RG-11/U type cable: Belden #7731A
   f. Coax, RG-11/U type, plenum-rated cable: Belden #7732A
   g. Mini Hi-Res, RGBHV type cable: Belden #1279R
   h. Mini Hi-Res, RGBHV type, plenum rated cable: Belden #1279P
   i. Low skew UTP type cable: Belden #7987R
   j. Low skew UTP type, plenum-rated cable: Belden #7987P
4. CATV / Satellite cable:
   a. Coax, RG-6/U CATV cable: Belden #9116
   b. Coax, RG-6/U CATV, plenum-rated cable: Belden #9116P
   c. Coax, RG-11/U CATV cable: Belden #1523A
   d. Coax, RG-11/U CATV, plenum-rated cable: Belden #1523AP
5. Antenna Cable:
   a. Coax, RG-58A/U type cable: Belden #8240
6. Control Cable:
   a. Control systems bus, 22AWG 1-pair + 18AWG 2-conductor cable: Belden #1502R

b. Control systems bus, 22AWG 1-pair + 18AWG 2-conductor, plenum-rated cable: Belden #1502P
c. Control system serial / DMX, multi-conductor cable: Belden #9841
d. Control system serial / DMX, multi-conductor, plenum-rated cable: Belden #82841

7. Digital Transport UTP, SM Fiber, MM Fiber Cables:
   a. Refer to section 271323 for fiber optic cabling requirements.

D. Cable Selection
1. Refer to functional diagrams for signal type between equipment.
2. Select an appropriate cable construction, including external jacket properties and armor, when installing cables in aerial, outdoor, underground and corrosive environments.
3. Select the appropriate rating and configuration of cable as required by local building code, electrical code, AHJ, and all applicable codes and regulations governing the installation.
4. Cables shall be continuous without splices.

2.06 CABLE TIES AND SUPPORTS

A. Use plenum-rated cable in plenum-rated spaces. Where plenum-rated cable is used, provide plenum-rated and approved cable ties and supports.

B. Manufacturer:
1. Thomas and Betts #TYV525M
2. Or approved equal

2.07 RECEPTACLES AND CONNECTORS

A. Acceptable Manufacturers: Canare, Switchcraft, Neutrik, Amphenol, Pomona, Extron, or Liberty.

2.08 MODULAR CONNECTION FRAMES AND MODULES

A. Manufacturer/Series:
1. Extron/AAP and MAAP
2. Legrand/AVIP
3. AMX/HPX
4. Crestron/FTA-CP

2.09 LABELS

A. Manufacturer:
1. Brady
2. Thomas and Betts

B. Wire and Cable Labels:
   1. Self-laminating adhesive laser labels
   2. Machine printable with a laser printer
   3. Cable size: as required
   4. Color: white label with black lettering
   5. Manufacturer: Brady wire marking labels WML–211-295 and WML-311-292

C. Device Labels:
   1. Self-laminating, type-on tape, adhesive labels. Use Helvetica 12-pt text

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that electrical requirements including junction boxes, floor boxes, ceiling loudspeaker enclosures, empty conduit and power circuits and receptacles are in place as shown on the drawings.

3.02 INSTALLATION

A. General: Include the delivery, unloading, setting in place, fastening to walls, floors, ceilings, counters, or other structures where required, interconnecting wiring of the system components, equipment alignment and adjustment, and other work, whether or not expressly required, which is necessary to result in complete operational systems.

B. Provide any accessory products required to provide a complete and functional cabling infrastructure system.

C. Physical Installation:
   1. Firmly secure equipment in place unless requirements of portability dictate otherwise.
   2. Provide adequate for fastenings and supports with a safety load factor of at least three.
   3. Secure plumb and square boxes, equipment, etc.
   4. Install every item so that it not only functions correctly and is serviceable and replaceable, but looks neat and professional.

D. Attachment of Devices to Displays and Projectors:
   1. Attach devices to displays and projects using 3M™ part number TB3571/TB3572 or an approved equal only.
   2. Prepare mounting surfaces per the manufacturer’s instructions.
   3. Where possible, mount devices inset from the sides of displays to minimize their visibility.
   4. Mount devices square and plumb.
   5. Mount each device such that neither the device’s nor the display’s cooling is impaired.

E. Equipment Configuration:
   1. Blu-ray disk players: Set color space to RGB.
   2. Scalers: Set output resolution to match that of the attached display device.
   3. Projectors: Disable electronic lens shift and keystone correction.
   4. EDID Strategy:
      a. The system color space will be RGB.
      b. Program EDID management preferences for a maximum input resolution of 1080P.
      c. Disable HDCP in EDID management preferences for computer inputs.

F. Security Configuration:
   1. Change default passwords; coordinate with the County's representative to obtain passwords for all password-protected devices and systems.
   2. Install the latest security patches for all included equipment and systems.
   3. Disable unused communication ports and protocols.

G. Cable Installation:
   1. Mark cables, regardless of length, with permanent, non-handwritten number or letter cable markers per the instructions below in Labeling. There shall be no unmarked cables in the system.
   2. Furnish screw-type terminal blocks, boards, strips, or connectors, for cables which interface with racks, cabinets, consoles, or equipment modules. Terminate wires terminating at screw-type terminals with crimp-on lugs. "Telephone-style" punch-down blocks are not acceptable for signal and data wiring.
   3. Group cables according to the signals being carried. In order to reduce signal contamination, form separate groups for the following cables:
      a. Power cables
      b. Control cables
      c. Analog video cables
      d. Digital audio and video cables
      e. Analog microphone audio cables
      f. Analog line audio cables
      g. Loudspeaker audio cables
      h. RF cables
   4. As a general practice, run power cables, control cables, and high level cables on the left side of an equipment rack as viewed from the rear. Run other cables on the right side of an equipment rack, as viewed from the rear. Where wiring issues preclude this orientation, it is acceptable to deviate from the directions above, as long as separation is maintained between signal and electrical power cables.
   5. Provide a service loop of appropriate length within racks and at boxes or points of termination to allow each piece of equipment to be removed from the front of the rack for servicing. Provide service loops at boxes or points of termination to allow the equipment to be removed and laid flat on a surface for servicing.

6. Install no cable with a bend radius less than that recommended by the cable manufacturer.
7. Clearly identify cable terminated in a floor pocket with permanent, indelible, computer or label printer labels within 6" of the cable connector. Provide strain relief for cables. Provide a minimum of 3' of free cable coiled in the floor pocket. Use nylon cable ties to group similar cable types.

H. Jacks and Connectors:
1. Panel-mounted jacks must be recessed and have isolated grounds.
2. Contacts must be silver- or gold-plated over brass.
3. Unless otherwise called for in these specifications and drawings, use the following types of jacks:
   a. Microphones without mute controls: XLR-3 female
   b. Microphones with mute controls: XLR-5 female
   c. Line level audio: Combination XLR-3 or ¼" TRS
   d. Loudspeaker: Neutrik Speakon or Switchcraft equivalent
   e. Video: BNC
   f. RF: F

I. Interface Plate Designation: Clearly engrave wall mounted interface plates with alphanumeric identification of input type (i.e., mic, line, speaker, video, etc.) and corresponding patch field designation.

J. Blank Panels:
1. Provide and install trim and blank plates in all floor, wall and furniture-mounted boxes that incorporate audiovisual connectivity within the assembly, including but not limited to:
   a. Blank standard ganged plates
   b. Blank Decora-style plates
   c. Blank modular (e.g., AAP and MAP) plates and inserts
   d. Blank vendor-specific plates and inserts

K. Grounding Procedures: In order to minimize problems resulting from improper grounding, and to achieve maximum signal-to-noise ratios, adhere to the following grounding procedures:
1. General: Because of the great number of possible variations in grounding systems, follow good engineering practice, as outlined above, and deviate from these practices only when necessary to minimize crosstalk and to maximize signal-to-noise ratios in the audio, video, and control systems.
2. System Grounds: Establish a single primary "system ground" for the systems in each particular area. Connect grounding conductors in that area to this primary system ground. Provide the system ground in the audio equipment rack for the area. The ground shall consist of a copper bar of sufficient size to accommodate secondary ground conductors.

3. Rack Ground:
    a. Connect the No.6 insulated copper wire connected to the earth ground to the primary system ground busbar in the Equipment Rack.
    b. Bond a No.12 TW stranded wire from the Equipment Rack frame to the primary system ground bus bar.
4. Equipment Grounds: Grounding methods used will be dependent upon individual equipment interconnection of chassis ground, circuit common, and power supply common within the units. Provide ground method for equipment types as follows:
    a. Equipment having a three-wire power cord with green wire of the power cord connected to chassis (Signal common is not internally connected to chassis): Make no connection from chassis ground to primary systems ground bus bar in Equipment Rack.
    b. Equipment having a three-wire power cord with green wire of the power cord connected to chassis: Make no connection from chassis ground to primary system bus bar, but do make connection with 14AWG insulated wire from circuit common to primary system ground busbar in Equipment Rack. Separate circuit common from chassis ground.
    c. Equipment having a two-wire power cord, no green wire, neutral is not tied to chassis, and circuit common is tied to chassis: Make connection from chassis to primary system ground bus bar using 14 gauge insulated wire.
    d. Audio Cable Shields: Ground audio cable shields at one point only. There are no exceptions. For inter- and intra-rack wiring connect the shield at one end only. For ungrounded portable equipment, such as microphones, connect the shield at both ends but grounded at only one end.

L. Recognition: Provide a single-rack-unit rack panel for each rack with the TEECOM logo, the Contractor's logo and the following text:
    1. Designed by: TEECOM, www.TEECOM.com
    2. Installed by: [Contractor Name]. [Contractor telephone number].

3.03 PROGRAMMING

A. Touch Panel / Control System
    1. Initial menu screen (splash screen) shall use a version of the County's logo generated without visible scaling artifacts for the size of the screen.
    2. Red shall only be used for alarm indicators and other buttons and indicators of special significance.
    3. Avoid all use of technical terms; use clear, everyday language. Instead of "System On", for example, use "Turn System On"; instead of "Power Down", use "Turn Power Off", etc.
    4. Ensure items with similar functions appear consistently in all menus.
    5. Ensure all buttons are sized similarly and spaced evenly.
    6. Ensure spelling is 100% correct.
    7. Menus throughout the project should appear and function consistently, across all touch panels and control system web pages.

8. Provide audible feedback for button presses; provide a volume control for this feedback in a tech menu.
9. Provide a tech menu for each touch panel. The tech menu shall offer control of button feedback volume, screen brightness, and other technician-specific functions required for each system.
    a. Provide in the tech screen a means to change the tech screen password.
    b. Obtain from the County's Representative a default password for all touch panel tech menus.
10. Provide web access for all IP-enabled control systems. Via IP, users and/or technicians shall be able to operate all functions provided via touch and pushbutton panels. Coordinate with the County's Representative to ensure a successful implementation of this requirement.

B. Projectors and other devices with frequent need for the replacement of consumables shall use the computer network for preventative maintenance.
    1. Coordinate with the County's Representative to obtain the default email address for maintenance messages.
    2. Ensure County's Representative can revise the maintenance email address via a simple method – using a single address for all networked AV devices. Contractor shall document this procedure in the Operations Manual.

C. Power Control and Sequencing
    1. Provide power control interfaces for devices not provided with these, whether these accessories are listed in this Section or not. Specify accessories compatible with the specified control products.
    2. Ensure that all non-essential items are turned off or placed in a low power consumption operation mode when system is turned off. At minimum, program the AV system to turn off the following types of devices when it is not in use.
        a. Audio amplifiers
        b. Audio processors
        c. Video switchers and processors
        d. Displays
        e. Projectors
    3. Sequence power on and power off cycles to ensure these take place with no audible and only minimally visible artifacts, pops, etc. When turning systems on, use the following sequence.
        a. Turn on source devices.
        b. Turn on processing and routing devices.
        c. Turn on amplifiers, displays and projectors.
    4. When turning systems off, use the following sequence.
        a. Turn off amplifiers, displays and projectors.
        b. Turn off processing and routing devices.
        c. Turn off source devices.

D. Coordinate with County's Representative regarding interfacing between AV power control devices and building management systems.

E. Using the rooms' partition sensors, automate audiovisual system combine/divide functions in AV-equipped rooms with operable partitions.

F. Coordination with Lighting and Window Coverings:
   1. The control system shall control the room's lighting and window covering systems:
      a. When a user pushes a button to set the audiovisual system in presentation mode, mesh shades shall be lowered.
      b. When a user pushes a button to set the audiovisual system in video conference mode, blackout shades, if these are provided, shall be lowered.
      c. When a user pushes a button to set the audiovisual system in video conference mode, the lights shall be set to a videoconference scene/preset.

G. Lighting System Programming and Interface Coordination
   1. Lighting Designer Responsibilities
      a. Via coordination with the project lighting designer, determine lighting scenes for each area with a low voltage-controlled lighting system
      b. For rooms with projection systems, provide a presentation-type scene that turns off any lights illuminating projection screens
      c. Assign a short name for each lighting scene. Coordinate with the AV control system programmer to determine maximum scene name length.
      d. Provide these names to the design team
   2. Lighting System Installer and Programmer Responsibilities
      a. Program lighting scenes per the lighting designer's list into the rooms' lighting systems
      b. Provide appropriate control protocol/preset information to AV control system programmer
      c. Coordinate with the AV control system programmer for hardware interface requirements between AV control systems and lighting systems
      d. Coordinate with GC to determine where lighting control cabling will run and who runs it
   3. AV Control System Programmer Responsibilities
      a. Program lighting scenes provided by the lighting designer into the appropriate control system menus. Use the provided scene names.
      b. Coordinate with the lighting system designer and GC for control cabling and termination, etc.
      c. Coordinate with the lighting system designer for testing and fine-tuning
      d. Train users in the use of appropriate lighting scenes ("Presentation" during projection, etc.)

3.04 COMPUTER INTERFACE/EXTENDER/TRANSMITTER CONFIGURATION

A. For computer interfaces, signal extenders and transmitters with integral input switching (VGA/HDMI, for example) program each device and any other system components involved so that the analog audio input is active regardless of which video input is selected.

3.05 FIELD QUALITY CONTROL

A. Initial Tests and Measurements: Before final adjustment and acceptance tests are scheduled, perform system checkout. Furnish required test equipment and perform work necessary to determine and/or modify performance of the system to meet the requirements of this specification. Include the following:
   1. Adjust, balance, and align equipment for optimum quality and to meet the manufacturers' published specifications.
   2. Perform the test procedure provided with this specification and return the completed form no less than one week prior to the initial punch walk.
   3. Install 1/8" diameter vinyl "map dots" as indicators for nominal operating positions of rotary, slider, or switch controls available for operator adjustment. Provide multiple indicators, adequately distinguished, for controls having more than one nominal operating position.

B. Twisted-Pair Cabling Infrastructure: If audiovisual system includes twisted pair cabling infrastructure, test the twisted pair cabling using the following procedure.
   1. Required Equipment:
      a. Fluke DTX-1800 or equal
   2. Test Procedure:
      a. Test each cable using the CAT5e Channel test
      b. Ensure that each cable passes the test. Re-terminate or replace all cables that do not pass.

C. Digital Video Cabling: Follow the following procedure to test each provided digital video cable.
   1. HDMI:
      a. Required Equipment:
         1) Quantum Data 780
         2) Or approved substitute tester
   2. DVI/SDI/HD-SDI:
      a. Required Equipment:
         1) Quantum Data 882D
         2) Or approved substitute tester
   3. DisplayPort:
      a. Required Equipment:
         1) Quantum Data 882E-DP
   4. Test Procedure:

1) Test each cable.
2) Discard all cables that fail

D. MATV/CATV/Satellite Cabling
Follow the following procedure to test the coaxial cabling infrastructure, if one is specified.
1. Required Equipment:
   a. Anritsu S332E
   b. Agilent N9330B
   c. Or equal
2. Test Procedure:
   a. Test each cable.
   b. Test the complete cabling system.
   c. Discard all cables and devices that fail

E. Audio System:
1. Loudspeaker-Line Impedance: Measure the impedance at 63 Hz, 250 Hz, and 1 kHz and the resistance of each loudspeaker line leaving the sound equipment rack with the line disconnected from its normal driving source. For lines to full-range distributed loudspeaker systems, measure the magnitude of impedance at 1 kHz.
2. Hum and Noise Level:
   a. Measure the hum and noise levels of the overall system for each microphone input channel and line-level input channel.
   b. Adjust gain controls for optimum signal-to-noise ratio so that full amplifier output will be achieved with 0 dBm at a line-level input.
   c. Terminate line-level inputs with shielded resistors of 150 and 600 ohms, respectively, for these measurements.
   d. Disconnect the loudspeaker lines and terminate the power-amplifier outputs with power resistors for these measurements. The value of the load resistor shall be within 5% of the nominal load impedance of the amplifier under test. The power rating of the resistor shall equal the power rating of the amplifier.
3. System Frequency Response:
   a. Measure the frequency response using the audio systems as described in Part 1. Adjust gain controls and equalizers to provide the octave-band sound levels as specified.
   b. Programmable Equalizers: Provide necessary controller with full audio spectrum display for the adjustment of programmable equalizers during system checkout. Do not provide equalizer programmers with the systems.
4. Uniformity of Coverage:
   a. Measure octave band of pink noise test signal, centered at 4 kHz, played through loudspeaker system.
5. Power-Output and Signal-Level Adjustment within System:

a. Measure the electrical distortion of the overall system for each line-level input channel.

b. Adjust gain control as for the tests specified herein.

c. Apply a 1-kHz sine wave signal from an oscillator having less than 0.5% total harmonic distortion at the input tested, at a level required to produce full amplifier output. Note that a pad with 150-ohm output impedance is required for driving the microphone-level input in accordance with the EIA standard.

d. Use a distortion analyzer to measure the output level and the total harmonic distortion of the amplification and control equipment. In the absence of a distortion analyzer, a high input impedance measuring device such as a DMM may be used to measure the output level. Lack of clipping or apparent deformation of a sine-wave input signal at the power amplifier output, as seen on the oscilloscope, may serve as evidence that distortion of amplification and control equipment is within acceptable limits.

e. Make measurements with loads actually incurred in the system operation. Power-amplifier loads shall be power resistors equal to the nominal load impedance of the output terminals used in the system.

6. Loudspeaker Polarity

a. Perform polarity checks of loudspeaker lines by means of a polarity tester or use DC source at one end of each line and a voltmeter at the other end. Loudspeaker lines shall be identically polarized with respect to color coding.

b. Test polarity of the loudspeakers using a sine-wave test signal warbled about 500 Hz. The listener shall be located on axis of the loudspeaker. Switch the loudspeakers from nominally in polarity to nominally out of polarity with respect to the selected loudspeaker. With the loudspeakers in proper polarity, the quality and clarity of the music or speech should be greater, and the warble test signal should clearly come to the surrounding space from the loudspeaker.

7. Freedom from Parasitic Oscillation and Radio-Frequency Pickup:

a. With systems set up for each mode of operation specified in the functional requirements, check to ensure that systems are free from spurious oscillation and radio-frequency pickup, in the absence of audio input signal and when the system is driven to full output at 100 Hz.

b. Employ an oscilloscope having at least 5 MHZ bandwidth for these checks.

c. Apply slow sine-wave sweep from 50 Hz to 5 kHz at a level of 6 dB below rated power-amplifier output voltage to each system. Listen carefully for buzzes, rattles and objectionable distortion.

d. Correct causes of these defects unless the cause is clearly from other than the sound amplification system's equipment and installation, in which case bring the cause to the attention of the County and Architect.

8. Audio Test Signal Paths: Verify operation from source inputs through system components to signal destinations.

F. Analog Composite Video System:
   1. Input Signal Level: Measure standard composite signal level with an oscilloscope across standard input impedance. Signal level shall be 1.0 volt peak-to-peak. Make system adjustments to attain required signal level.
   2. Signal-to-Noise: Operate system at standard input and output levels. Terminate with standard load impedance. Measure noise level using oscilloscope for signals from 10 kHz to 4.2 MHZ and an RMS volt-meter for signals from 0 to 10 kHz, and calculate signal-to-noise ratio.
   3. Differential Gain: Using a step generator and waveform monitor measure chrominance, luminance, and normal synchronizing and blanking signals. Measure variation in amplitude of the chroma sub-carrier at 10%, 50%, and 90% luminance.
   4. Differential Phase: Operate system as defined above and measure variation in phase of the chroma sub-carrier at 10%, 50%, and 90% luminance.

G. Optical System:
   1. The light intensity shall be measured at five positions of the projected image (center and four corners) after the projector has been adjusted to provide the light output as specified above.
   2. The "corner" locations shall be defined as the four points determined by intersecting lines drawn 5% of the distance in from the focused edges of the image.
   3. The light meter used for the above measurements shall be a properly calibrated footcandle (or lux) meter and shall be cosine-corrected.

H. Control System:
   1. Verify operational functions at each control interface position.
   2. Verify operational functions of wireless control device.
   3. Verify operational functions of the control system and interfaced devices.

I. Radio Frequency (RF) System:
   1. Use a standard television receiver connected to each system outlet. Make a subjective evaluation of picture quality and verify that no visible components of cross modulation, ghosting, or beat interference appear when the receiver is tuned to each of the desired channels.
   2. Using an RF signal strength meter, record the signal levels in dBmV of modulated carriers transmitted through the system at representative outlets.
   3. RF Test Signal Paths: Verify proper operation of the system from source inputs to the head end, including antennas, CATV feeds, and modulators, through line amplifiers, splitters, and directional couplers, to system outlets.

3.06 LABELING REQUIREMENTS

A. General Requirements
   1. Label the audiovisual system components. The components include, but are not limited to, the following:

a. Equipment Enclosures
b. Rack-mounted AV Devices
c. Portable AV Devices
d. Batteries
e. Wires and Cables
f. Equipment Racks
g. Terminal Blocks
h. Relays
i. Patch panels, and the termination positions within the patch panels

2. Provide labels that are consistent with the AV documentation.
3. Prior to installation, degrease and clean surfaces to receive nameplates and labels

B. Equipment Enclosures
1. Label each rack and cabinet with a designation corresponding to the system documentation.
2. Mount the label on the top of the rack or cabinet, centered horizontally.
3. Color: Black background with white lettering.
   a. Example: Line 1: "AV-01" (1/2-inch high letters)
4. Audiovisual Devices
5. Label rack mounted devices associated with AV systems with a permanent, machine-generated, laminated label. Use 12-point black Helvetica text with a white background.

C. Batteries
1. Label batteries with the month and year they were installed.
2. Example: "April 2004"

D. Wireless Transmitters and Receivers
1. Label wireless transmitters and receivers, including, but not limited to wireless microphone systems clearly so users can identify the transmitter associated with each receiver.
2. Use an identifier that associates each transmitter with the room it is associated with, such as a room number.
3. Example: Rm. 230-Mic 1

E. Wire and Cable
1. Identify wire and cable clearly with permanent machine-generated labels wrapped about the full circumference within one-inch (25mm) of each connection.
2. Indicate the cable ID designated on the associated field or shop drawings and run list.
3. Assign wire or cable designations consistently throughout a given system; i.e., each wire or cable must carry the same number at both ends.
4. Position labels so they are clearly visible without the need to remove wire management devices or other obstructions.

5. At each end of the cable, indicate the device and connector the cable connects to.
6. Example: AV 3101
   Mtrx Swx In-1

F. Terminal Blocks
   1. Label consistently with each block's designation in the AV documentation.

G. Relays and Transformers
   1. Label consistently with each relay's and transformer's designation in the AV documentation.

H. Patch Panels
   1. Using two-line designations, indicate groups of inputs and outputs on the upper row of top ports and the lower row of bottom ports.
   2. Example: Mixer Mic Inputs
      In-1 | In-2 | In-3 | In-4, etc.

3.07 COOLING PROVISIONS

A. Utilize thermostatically-controlled active cooling devices if necessary to keep device temperatures below manufacturer-specified maximums. Systems including devices operating above manufacturer-specified limits shall be rejected. Cooling systems utilizing fans running continuously, without thermostatic controls, will be rejected.

3.08 COUNTY TRAINING

A. Provide training on the installed systems at the project site by a suitably qualified instructor, to designated personnel, to instruct them in the operation and maintenance of the systems.

B. Arrange with the equipment manufacturer for such instruction, at no additional cost, in the event qualified instructors are not available on staff for certain sophisticated equipment.

C. Schedule the first training after the systems are operational. Provide a minimum of four hours of training (total) on the systems included in this specification.

3.09 SYSTEM ACCEPTANCE TESTS

A. System acceptance tests shall be performed when initial system checkout has taken place and the Initial Testing and Tuning Report has been completed and submitted by the Contractor. The system acceptance tests consist of the following:
   1. Take a physical inventory of equipment on site and compare to equipment lists in the contract documents.
   2. Demonstrate the operation of system equipment.
   3. Both subjective and objective tests will be required to determine compliance with the specifications. Provide test equipment specified for these tests.

4. Provide final, "as-built" drawings, run sheets, manuals, and other required documents, as detailed in Part 1.
5. Provide complete testing reports generated by subsystems that provide self-testing.

B. Initial Testing and Tuning Report
   1. Use additional pages as necessary to allow complete comments.

Test	Description	Result	Comment
1	Record all equipment that was specified but is not present. Provide a reason why this equipment is not present.		
2	Confirm no sharp or jagged surfaces are accessible to a user.		
3	Confirm that each active device's external temperature, measured externally using a non-contact thermometer, is within manufacturer's guidelines.		
4	Perform and log cable inspection. Confirm each cable is labeled, dressed, included in a bundle with cables with like signals, not under stress, is serviceable, is correctly strain-relieved, is not bent beyond manufacturer's recommended bend radius, does not have tie wraps tensioned excessively or used inappropriately. Confirm labels are positioned and oriented in a consistent manner and are legible and unambiguous.		
5	Demonstrate that the full inventory is new equipment, in full compliance with the specification, or as modified by approved submission. Record test results as pass/fail, and list exceptions.		
6	Confirm rack elevation and flow drawings, cable and other labels and engravings are an accurate model of the furnished system, and are in compliance with latest revised specifications. Record test results as pass/fail.		
7	Confirm all inputs and outputs of switchers are labeled (wherever possible), so that users can easily make manual routes quickly without having to refer to the system drawings.		
8	Confirm all channels on amplifiers are properly labeled, so technicians can make quick adjustments without having to refer to the system drawings.		
9	Confirm all rack mounted equipment is labeled and that the labels match those on the drawings (equipment symbols and/or description), control system, field plates, patch panels, and any labels associated with the system.		
10	Confirm RJ terminations are solid in their connectors.		
11	Confirm each coax cable respects a bend radius of at least 5x the cable's radius or as recommended by the manufacturer.		
12	*Record ambient noise, A-weighted, slow.*		

Test	Description	Result	Comment
13	Confirm all power amplifiers are working within rated load. *Record the impedance (and at what frequency) of each loudspeaker line on each power amplifier at 63, 250, and 1,000 Hz.*		
14	Using appropriate test signals, have the sound system produce a nominal operating level of __(65) dB SPL (Sound Pressure Level) for conference speech, __(60) dB SPL for program material, "A" weighted at all listeners' ears ±__(2) dB ("Uniformity of Coverage") (or at least __(15) dB above the ambient noise, A-weighted, whichever is greater), with the control system volume control indicating "normal" or default setting. *Record results for each channel and source.*		
15	Confirm system is capable of producing an additional __(15) dB above this level (__(80) dB SPL) for each audio source, with less than 0.5% THD (Total Harmonic Distortion) plus noise. *Measure THD plus noise when source is at __(15) dB above nominal operating level at each "destination", for all sources selected.*		
16	Confirm system develops a noise level that is electrically __(55) dB below the normal operating level for all audio sources. "Noise" refers to hum, electrostatic noise, RF interference, etc. *Measure and record Signal to Noise ("signal" measured electrically at nominal operating level at each destination, for all sources selected.*		
17	Confirm program loudspeakers are connected in the same polarity, and speech reinforcement systems are polarized such that a positive acoustic pressure on a microphone results in a positive acoustic pressure at the loudspeaker ("Polarity Test").		
18	Confirm system produces no more than a __(1) dB variance in program source levels when each program source is playing audio from a calibrated medium (CD, test signal generator, etc.)		
19	Confirm there is no audible vibration caused by improper mechanical installation. *Use a continuous sweep signal at headroom level (from generator or test CD.) Provide a pass/ fail result and document which device fails and the frequency of these artifacts.* ("Buzzes and Rattles Test").		
20	Confirm speech reinforcement systems are stable, with no ringing nor feedback.		
21	For audio conference systems, adjust microphone input gain to demonstrate that a "standard talker" (60 dB SPL at 1 m), positioned at each talker position in the room, produces a 0 dB level at the input of the mixer bus of the audio conference DSP device. If there is local voice reinforcement ("mix-minus"), AGC and ALC may need to be restricted. *Record test results as pass/fail. Record level across analog telephone line, if one is used. Inspect DSP mixer telephone line levels, both transmit and receive, when normal speech is encountered in the room.*		

Test	Description	Result	Comment
22	For conferencing mode, at the __(65) dB SPL listening level, confirm full duplex operation, with no reports of echo or "speech trails" (as detected from the far end).		
23	Confirm equalizers, whether hardware or virtual, are adjusted for best intelligibility, and in accordance with the preferred acoustic level response curves. *Record the "house curve" before equalization, as well as after the equalizers have been tuned, with and without microphone input filters. If requested by the Consultant, produce this documentation for systems without equalizers, as this test may apply to the preamp filter settings in cases where intelligibility can be improved.*		
24	If required, confirm system intelligibility, with a RSTI (Rapid Speech Transmission Index) greater than 0.85.		
25	For wireless microphone systems, with all wireless microphones turned on, confirm that throughout the specified operating area for the transmitter, there are no dropouts, intermodulation interaction between wireless systems, or RF caused artifacts.		
26	If required, for NTSC sources, placing a test generator at each source shall produce 1 volt peak-to-peak to each destination ± 10% (or 1dB). R*ecord results at each destination using NTSC bars, peak white, and 5-step multiburst (0.5, 1.0, 2.0, 3.0, 3.58, and 4.2 MHz).*		
27	Also for NTSC sources, confirm optimum brightness, contrast, and color in displays using SMPTE source with PLUGE (Picture Line Up Generation Equipment) display.		
28	Where several displays are visible in the same space, confirm picture tonal consistency across all of them. For composite video signals use a NTSC bars with PLUGE signal to all. For RGB and digital video signals use a colorimeter and test color signal software to confirm consistent images		
29	For RGB sources, demonstrate 700 mV ± 10% (or 1 dB) from each source to each destination. *(If requested only) record results using a flat-field pattern signal at the highest resolution specified, or at least 1,600 by 1,200 resolution. For RGB sources, measure and record peak-to-peak voltage for peak white signal, and record "peak" and "Level" control settings on any interface at the positions whereby the 700 mV voltages were attained.*		
30	Confirm projectors are focused, centered, and evenly illuminated. *If requested, confirm using the calibrated light meter that the brightest measurement locations shall be no more than +10% above average, and the dimmest locations no less than –5% below average measurement. Also if requested, document that geometric distortion is within 2% tolerance. Take actual measurements if necessary (top, bottom, left, right dimensions of white portion of screen) and photograph if necessary.*		

Test	Description	Result	Comment
31	Confirm system displays with stability, with no scaling-related visual artifacts when switching between, at a minimum, 1,600 x 1,200, 1,024 x 768, 1,280 x 1,024, 1,920 x 1,080, 1,920 x 1,200 and 1,280 x 720 sources, and/or all those specified in the performance criteria for this system. *Record test results.*		
32	Where HDMI, DVI, or DisplayPort signals are included in the system, confirm that an acceptable signal is being displayed on the monitor from each source position. Use the Alt Pixel test image (pixel-on, pixel-off) for each resolution included in the design intent: 1,920x1,200@60, 1,920x1,080@60, 1,280x720@60, 1,366x768@60, 1,024x768@60, 800x600@60, 1,600x1,200@60 as required. Inspect each, leaving the signal on for three minutes. No artifacts shall be visible. Note: If the signal is going to a codec, HDCP should be turned off . If the signal is going to a display, HDCP should be turned on for a complete HDMI test to verify cables and display input.		
33	Confirm HDCP is maintained from sources to destinations except as excluded above. Confirm EDID is managed correctly and that devices output at resolutions supported by the system.		
34	Confirm the control system controls all of the required equipment as specified. Confirm system performs with stability and in sync with the equipment being controlled without the need to reset any item of equipment. Confirm that user interface requirements dictated in Part 3 of the audiovisual specifications have been met.		
35	Confirm system is serviceable: all devices must be easily removable for repair by one person; all cables must be dressed neatly and be provided with adequate services looks, must be bundled in forms (refer to “Sound System Engineering”, Davis and Davis, 1987 and “Audio Systems Design and Installation, Giddings, 1990,”) having no excessive pressure on cables at termination points and connectors, and each cable number must agree with the shop drawings and cabling run list.		
36	Confirm all switches and receptacles are be logically and permanently labeled.		
37	Confirm all nomenclature for consistency: drawings, touch screen, wall plates, floor boxes, patch panels, equipment, etc.		
38	Confirm all patch cables have cable numbers.		
39	Where cameras are included in system, confirm each operates correctly and provides correct image quality.		
40	Confirm camera presets are programmed as specified by the user.		
41	Confirm TV reception from all sources (OTA, CATV, etc.) and that		

Test	Description	Result	Comment
	all channel presets are accurate.		
42	Confirm that all codec options specified by the customer have been installed.		
43	Confirm and document IP addresses and configuration information provided by the client and loaded into systems, including IP addresses, subnet masks, gateways, time server, gatekeeper, etc. Confirm that all network functions specified by the customer function properly on the customer's LAN.		
44	Confirm all web-based system control and monitoring features, and other IP functionality of system (time servers, system-generated e-mail, etc.) are completely functional.		
45	Confirm that display devices have On-Screen Displays/Menus disabled. If the customer has directed otherwise, indicate from which person this direction came.		
46	Confirm that video projectors have blue screens or other images or colors displayed in the absence of an input signal disabled. If the customer has directed otherwise, indicate from which person this direction came.		
47	Log all test conference calls (audio and video). Log shall include time, line used, number called, success of connection, who was spoken with at the far end, success of full duplex, success of auto-disconnect, dBSPL in the room. Note static, jitter/packet loss, or any other artifacts, distortion, etc. Note if auto-disconnect functions as specified.		
48	Confirm no display device has lost pixels when a Full White Test signal is displayed (7 pixels maximum per quadrant, or per manufacturer's spec). Note number and location of lost pixels, if any. Provide photos.		
49	Check for excessive vibration on VC camera(s) at full telephoto position.		
50	Provide video recording of all non-conformances and anomalies.		
51	Confirm all visible devices are installed square and plumb.		
52	Confirm no dust, grease, scratches, or any other signs of handling are visible on any devices		
53	Confirm assistive listening systems work throughout intended listening areas		
54	Confirm closed captioning is functional on all displays		
55	Confirm control system user interfaces provide a means to enable and disable display of closed captions		

C. In the event further adjustment is required, or defective equipment must be repaired or replaced, tests may be suspended or continued at the option of the County or County's representative.

1. If the need for further adjustments becomes evident during the demonstration and testing, continue work until the installation operates properly. Included in the continued work shall include, but not be limited to, changes to or installation of resistive pads, adjustment of loudspeaker aiming, adjustment of system processing, programming changes to the control system, convergence and/or alignment of the video projector, if these adjustments are required.
2. If acceptance of the system is delayed because of defective equipment or because the equipment does not fulfill this specification, reimburse the County for time and expenses for these tests during extensions of the acceptance-testing period.

3.10 CLEANUP AND REPAIR

A. Upon completion of the work, remove refuse and rubbish from and about the premises, and shall leave the relevant areas and equipment clean and in an operational state. Repair damage caused to the premises by the installation activities, at no cost to the County.

3.11 PROTECTION OF WORK

A. During the installation, and up to the date of final acceptance, protect finished and unfinished work against damage and loss. In the event of such damage or loss, replace or repair such work at no cost to the County.

3.12 SERVICE AND MAINTENANCE

A. Provide cost for additional service levels beyond the one-year warranty period and maintenance calls as listed
   1. One year, two-year, and three-year service with quarterly pre-emptive maintenance calls and same-day issue response
   2. One year, two-year, and three-year service with quarterly pre-emptive maintenance calls and 24-hour issue response
   3. One year, two-year, and three-year service with quarterly pre-emptive maintenance calls and 48-hour issue response

B. Pre-emptive maintenance minimum requirements:
   1. Cleaning of filters, lenses and general dusting of all equipment
   2. Verification and adjustment of focus and projector position
   3. Verification that all controlled devices are functioning
   4. Note any conditions that may affect the continued function and well-being of the audiovisual system and report to County
   5. Report projector lamp life to the County and replace lamps as directed

END OF SECTION 27 41 16

SECTION 27 51 19

SOUND MASKING SYSTEMS

PART 1 - GENERAL

1.1 GENERAL

A. The invitation for bids, instruction to bidders, and general conditions of the contract including supplements apply to all work under this section.

1.2 SCOPE

A. Supply and install complete sound masking systems including all apparatus and equipment, wiring, labor, and services required to provide systems as specified and as shown on drawings.

B. Supply and install any incidental equipment needed in order to meet the functional requirements stated herein and on drawings.

C. Furnish all test equipment and the services of one person to assist the County's Representative in the final tuning and acceptance testing.

D. Make any adjustments to any part of the system which may be found necessary during the acceptance testing.

E. Provide a total of 1 hour of training in the operation of the system to the person or persons selected by the County's Representative.

1.3 SUBMITTALS

A. Substitutions of equal equipment beyond the alternatives listed will be permitted only with written permission requested not less than 10 days before the close of bidding. If a requested substitution requires a change in any of the contract drawings, a revised drawing must be submitted as part of the substitution request. The Electroacoustical Consultant shall be the final judge of the acceptability of substitutions.

B. Drawings required for approval prior to fabrication and installation:
1. Block diagrams indicating proposed connections.
2. Loudspeaker mounting drawings.

C. As Built Drawings and Instruction Manuals:
1. Functional Diagram: single-line block diagram showing interconnection of all components: receptacles, terminal blocks, controls, transformers and loudspeakers in addition to the active elements. Include terminal and

cable numbers. Mount one original or photograph (not blueprint) copy behind acrylic inside the door of the equipment rack.

2. Instruction Manual: include the diagram specified above along with manufacturer's installation, operating and service information for each item of equipment furnished. Provide three copies to the County's Representative after they have been reviewed and approved by the Electroacoustical Consultant.

1.4 WARRANTY AND SERVICE

A. Installation warranted free of faulty workmanship.

B. All components, including solid-state devices, warranted free of defects for a period of one year from date of final acceptance. This minimum warranty provision shall not diminish the terms of individual equipment manufacturers' warranties.

C. Paint and exterior finishes, fuses and lamps excluded from above warranties except when damage or failure results from defective materials or workmanship covered by warranty.

D. Provide maintenance service for a period of one year after acceptance of installation. Service to consist of at least two semiannual visits to the site for checking and adjustment of equipment.

E. Answer all service calls within 24 hours.

1.5 ELECTROACOUSTICAL CONSULTANT

To be determined.

PART 2 - PRODUCTS

2.1 ELECTRONICS

A. Masking Loudspeaker:
   1. Features
      a. Speaker type: TBD.
      b. Dimensions: TBD
      c. Power handing capacity 20 Watts minimum
   2. Acceptable: Dynasound, Inc. DS 1356 or equal

B. Masking Noise Generator/Equalizer/Power Amplifier:
   1. Features:
      a. 2 channels of independent, uncorrelated, non-repeating pink noise generators
      b. 2 channels of independent 1/3 octave band graphic equalization

c. Output: Frequency response +/- 3dB 80-20,000 Hz
d. All parameters are setup and controlled with a Graphic User Interface managed with a local computer; software provided by the manufacturer.

2. Acceptable: Atlas Sound DSP 2210 Multi Zone Digital Controlled Processor or equal

2.2 HARDWARE

A. Equipment Racks:
1. Features:
a. single rack space – possibly unused part of server rack space
b. accessible monitor panel with small loudspeaker or headphone jack and VU indication to monitor both channels of system
2. Location: TBD by County's Representative

B. Loudspeaker Lines:
1. Twisted color-coded stranded conductors.
2. Lines from equipment rack to ceiling plenum in all areas run in conduit.
3. Lines for distribution above ceiling not in conduit unless required by code.

C. Passive Monitor Panel:
1. Internal loudspeaker, volume control, multi-position line selection switch, and VU meter, or LED bar graph meter for each channel
2. Acceptable: TOA MP1216 or equal.

PART 3 - INSTALLATION

3.1 GENERAL

A. Number all wires and cable and label them at every termination and connection point with permanent type markers such as Electrovert Inc. type C, Z or S. Record these wire numbers on as-built drawings.

B. Wire all racks completely in the sound contractors shop. No internal rack wiring to be done on the job site.

C. Seismic Restraints:
1. All hanging or shelf mounted equipment and cabinets furnished including, but not limited to, racks and loudspeakers shall be secured to substantial building structure so as to resist seismic acceleration in any direction up to a limit of the greater of 1.0 G or the limit prescribed by governing codes.
2. Loudspeaker mounting details, rack bracing, and other seismic restraints are not shown on the contract drawings; it shall be the contractor responsibility to develop these drawings.
a. Loudspeakers should not be mounted below any obstructions or within 1 ft of ductwork

b. Movement within a 2 ft radius to avoid these obstructions is allowable.

3.2 INITIAL TESTS AND ADJUSTMENTS

A. Warning: At no time while any personnel who will occupy the building are present shall the contractor turn the noise on or off, change the noise level, operate the system with the noise levels higher than specified herein, or cause the system to emit any other sounds, without specific contrary instructions from the consultant. All testing and adjusting of the system shall be accomplished while such personnel are absent and, if possible, before the space is initially occupied; thereafter, the system shall be left off until completion of final adjustments and acceptance tests. These precautions are essential to ensure that the attention of the occupants will not be unnecessarily drawn to the noise or to its source.

B. Tests:
1. Hum and Noise Level: Hum and noise shall be inaudible in all areas served by the system.
2. Loudspeaker Operation: Each loudspeaker shall be checked for proper functioning to ensure uniform distribution of sound.
3. Uniformity of Background Sound Coverage: The A-weighted sound pressure level shall not vary more than a total of 4 dB (+/-2 dB from average) between any two measuring positions in each room.

3.3 FINAL ADJUSTMENTS AND ACCEPTANCE TESTS

A. The acceptance testing of the completed installation shall be performed by the consultant with the assistance of the contractor.

B. If final acceptance is delayed because of installation not in accordance with these specifications, contractor shall pay for all additional time and expenses of the consultant during any resulting extensions of the acceptance testing period.

C. Measurements of system performance shall be made using a 1/3 octave real-time analyzer approved by the consultant, furnished by the contractor.

D. Masking Sound Frequency Spectrum:

1/3 Octave Band Center Frequency (Hz)	1/3 Octave Band Sound Pressure Level (dB)
200	+5
250	+5
315	+4
400	+4
500	+3
630	+2
800	+1
1000	0*

1250	-1
1600	-3
2000	-5
2500	-7
3150	-9
4000	-11
5000	-13
6300	-16
8000	-21

* arbitrary reference

E. Background Sound Level: After the frequency spectrum has been set, the sound level as measured in the 1/3 octave band centered at 1000 Hz shall be adjusted for 38 dB in all open plan areas, and 32dB in closed office areas unless otherwise directed. The overall masking level shall be 44 dBA +/-2 dB in open office, and 38 dBA in closed areas after the spectrum and level have been set.
   1. The system shall be capable of sound levels up to 55 dBA.

F. Uniformity of Background Sound Coverage: The A-weighted sound pressure level shall not vary more than a total of 4 dB (+/-2 dB from average) between any two measuring positions in each room.

G. Provide shut off capability for areas where teleconferencing is to occur. Shut off switch should be located within teleconferencing space.

H. System to be capable of providing paging services.
   1. The paging volume shall be adjustable in 0.5 dB increments over a range of 35 dBA to 70 dBA within the areas to be served.

I. System to be capable of providing background music.

J. The contractor shall be responsible for adjusting loudspeaker transformer taps and/or relocating of loudspeakers to meet the uniformity of coverage requirement, and shall do so without claim for additional compensation.

K. Final acceptance of the installation will be granted when it is clear to the County's Representative that the following conditions have been met:
   1. All equipment has been furnished and installed according to these specifications and the County's Representative directions on location.
   2. All equipment and installation have been tested and shown to perform as specified.
   3. Instruction books and wall-mounted diagrams have been completed and delivered to the County's Representative.

END OF SECTION 27 51 19

SECTION 28 00 00

BASIC SECURITY REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes general administrative and procedural requirements for sections numbering 28 xx xx and is intended to supplement, not supersede, the requirements specified in Division 01.

B. The requirements described herein include the following:
   1. References
   2. Definitions
   3. System Description and Existing Conditions
   4. Submittals
   5. Quality Assurance
   6. Permits and Inspections
   7. Coordination
   8. Project Management and Coordination Services
   9. Product Delivery, Storage, and Handling
   10. Warranty
   11. Maintenance

C. Products Supplied But Not Installed Under This Section:
   1. None

D. Products Installed But Not Supplied Under This Section:
   1. None

E. Products Specified But Not Installed Under This Section:
   1. None

F. Products Furnished and Installed Under another Section:
   1. 120V power
   2. Conduit, junction boxes, device boxes (essentially rough-in)
   3. Door hardware
   4. Network cabling and equipment
   5. Connectivity to POTS lines

G. Alternates:
   1. ALT-280000-01: Renewable Annual Maintenance Agreement
      a. Submit a renewable annual maintenance agreement proposal for the servicing and adjustment of the existing security system equipment.

b. Perform bi-annual examinations by trained personnel including necessary measurements, adjustments, and parts replacement to keep the equipment in efficient and proper operation.
c. Perform maintenance work, except emergency repairs, during regular working hours of regular working days.
d. Perform emergency repairs on an immediate basis (four hour response time maximum, 7 days a week, 24 hours a day) when a system or component malfunctions during use.
e. Do not subcontract or assign maintenance work unless County has approved such assignment in writing.

2. ALT-280000-02: Alarm Monitoring Agreement
   a. Provide an alarm monitoring agreement for the IDS with the following features:
      1) Opening and closing reports
      2) Daily test
      3) Cellular backup
   b. Coordinate with County for alarm dispatch requirements and contact information.

H. Related Sections:
1. Consult other Sections, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable installation.
2. Section 26 05 33, “Raceway and Boxes for Electrical Systems”
3. Section 26 05 43, “Underground Ducts and Raceways for Electrical Systems”
4. Section 27 05 28, “Pathways for Communications Systems”
5. Section 28 05 13, “Security System Cabling”
6. Section 28 05 53, “Security System Labeling”
7. Section 28 08 00, “Security System Acceptance Testing”
8. Section 28 13 00, “Access Control and Alarm Monitoring System”
9. Section 28 16 00, “Intrusion Detection System”
10. Section 28 23 00, “Video Surveillance System”
11. Section 28 26 00, “Security Communications”
12. Division 27
13. Earthwork: Include trenching, backfilling, boring and soil compaction as required for the installation of underground conduit, in-grade pull boxes, vaults, and bollard foundations.
14. Selective Demolition: Nondestructive removal of materials and equipment for reuse or salvage as indicated. Also dismantling electrical materials and equipment made obsolete by these installations.
15. Concrete Work: Include forming, steel bar reinforcing, cast-in- place concrete, finishing and grouting as required for underground conduit encasement, pedestal foundations, and curbs. [Also includes saw-cutting of existing slabs and grouting of conduits in saw-cut.]

16. Miscellaneous Metal Work: Include fittings, brackets, backing, supports, rods, welding and pipe as required for support and bracing of raceways, equipment enclosures, cameras, and similar devices.
17. Miscellaneous Lumber and Framing Work: Include wood grounds, nailers, blocking, fasteners, and anchorage for support of security materials and equipment. Refer to Division 6, Rough Carpentry.
18. Moisture Protection and Smoke Barrier Penetrations: Include membrane clamps, sheet metal flashing, counter flashing, caulking and sealant as required for waterproofing of conduit penetrations and sealing penetrations in or through fire walls, floors, ceiling slabs and foundation walls. Tape and make vapor tight penetrations through vapor barriers at slabs on grade.
19. Division 8 Locking Hardware: Include interface to electronic hardware and door controllers on security related doors.
20. Access Panels and Doors: Required in walls, ceilings, and floors to provide access to security devices and equipment.
21. Painting: Include surface preparation, priming and finish coating as required for security cabinets, exposed conduit, pull and junction boxes, and devices where indicated as field painted in this Division.

1.02 REFERENCES

A. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies mean that latest edition of such publications adopted and published prior to submittal of the bid. Consider such codes or standards a part of this Specification as though fully repeated herein.

B. Codes: Perform Work executed under this Section in accordance with applicable requirements of the latest edition of governing codes, rules and regulations including but not limited to the following minimum standards, whether statutory or not:
   1. California Code of Regulations (CCR):
      a. Title 8, “Industrial Relations”
         1) Chapter 3.22, “California Occupational Safety and Health Regulations (CAL/OSHA)”
      b. Title 24, “California Building Standards Code”
         1) Part 1, “California Building Standards Administrative Code”
         2) Part 2, Volumes 1 and 2, “California Building Code” (CBC)
         3) Part 3, “California Electrical Code” (CEC)
         4) Part 11, “California Green Building Standards Code” (CALGeen)”
   2. National Fire Protection Agency (NFPA)
      a. NFPA 70, “National Electrical Code” (NEC)
      b. NFPA 75, “Protection Of Information Technology Equipment”
      c. NFPA 262, “Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces”, 2007
   3. United States Department of Labor (DOL) Occupational Safety and Health Administration (OSHA) Regulations (Standards - 29 CFR)
      a. Part 1910, “Occupational Safety and Health Standards”

   b. Part 1926, “Safety and Health Regulations for Construction”
4. Code of Federal Regulations (CFR) Title 47 “Telecommunication”, Chapter I “Federal Communications Commission (FCC)”:
   a. Part 15, “Radio Frequency Devices and Radiation Limits”
   b. Part 27, “Miscellaneous Wireless Communications Services”
   c. Part 68, “Connection of Terminal Equipment to the Telephone Network”
5. International Code Council
   a. International Building Code
   b. International Fire Code
   c. ICC Performance Code
6. Other applicable national, state, and local binding building and fire codes

C. Standards: Perform Work and furnish materials and equipment in accordance with the latest editions of the following standards as applicable:
1. Underwriter's Laboratories (UL): Applicable listing and ratings.
   a. UL 294, “Access Control System Units”
   b. UL 1076, “Proprietary Burglar Alarm Units and Systems”
   c. UL 2044, “Commercial Closed-Circuit Television Equipment”

1.03 DEFINITIONS

A. The Definitions of Division 01 apply to the sections of Division 28.

B. In addition to those Definitions of Division 01, the following list of terms as used in this specification defined as follows:
1. “ACAMS”: Access Control & Alarm Monitoring System
2. “As directed”: As directed or instructed by County, or their authorized representative
3. “Cabling”: A combination of cables, wire, cords, and connecting hardware [e.g., cables, conductor terminations, connectors, outlets, patch panels, blocks, and labeling]
4. “Connect”: To install required patch cords, equipment cords, crossconnect wire, etc. to complete an electrical or optical circuit
5. “Engineer”: TEECOM
6. “Furnish”: To purchase, procure, acquire, and deliver complete with related accessories
7. “Contractor”: TBD
8. “IDS”: intrusion detection system
9. “Install”: To set in place, join, unite, fasten, link, attach, set up or otherwise connect together and test before turning over to County, parts, items, or equipment supplied by Contractor or others. Complete installation and make ready for regular operation
10. “County”: Alameda County
11. “Provide”: furnish and install
12. “Security System”: the ACAMS, IDS, VSS, and Entry Telephone systems collectively and integrated

13. "SEC": Security Equipment Enclosure
14. "VAC": volts alternating current
15. "VDC": volts direct current
16. "VSS": video surveillance system

1.04 SYSTEM DESCRIPTION

A. Overview
   1. The Alameda County is renovating 4-story multi-level buildings at 393 13th Street in Oakland CA.
   2. Security at the new facility consists of access control and alarm monitoring (ACAMS), video surveillance (VSS), intrusion detection (IDS), and entry telephone. The ACAMS will be an expansion of the existing County AMAG system to automate opening and closing the buildings, control access through designated doors, and will restrict after-hours access to authorized cardholders, and the IDS will monitor specific spaces for intrusion.
   3. The new system will connect to County's exiting head end over the County's LAN/WAN.
   4. The System includes integration to the Fire/Life Safety system to disconnect power to door in the designated path of egress.
   5. The System includes integration between ACAMS, VSS and the elevator system including traveler cable.
   6. Refer to individual sections for detailed description of systems.

B. Custom Device Requirements
   1. General: Provide a high level of coordination services to ensure the proper installation and functioning of the security system. Coordinate the installation of the security system with other trades. This may include: review of other trade's shop drawings, attendance at meetings, providing samples for mockup, and preparation & distribution of written documentation.

1.05 SUBMITTALS

A. Submit required submittals in accordance with the requirements of Section 01 33 00 "Submittal Procedures".

B. Required submittals include the following:
   1. Written detailed project description
   2. Project schedule as referenced in this section
   3. Product data sheets – clearly indicate by arrows or brackets precisely what is being submitted on and those optional accessories which are included and those which are excluded
   4. Estimated delivery lead times for products
   5. Voltage drop calculations demonstrating less than ten percent voltage loss to individual security devices

6. Battery calculations showing backup support of security equipment and locks (except egress hardware with local power supplies) or 25 lock activations or 4 hours, whichever is greater.

C. Complete submittals are comprised of shop drawings and product data sheets as detailed below and related sections (covering specific security systems). Incomplete or partial submittals will be rejected.

D. Shop Drawings
1. Shop drawings shall document Contractor's intent to execute the work and shall include the following:
   a. Title sheet and index
   b. Floor plans showing device locations, cable routing, and pathways
   c. System block diagrams
   d. Point-to-point wiring diagrams
   e. Specific wiring details and device mounting/installation details
   f. Schedules:
      1) Building/floor
      2) Unique device name/number
      3) Security controller/location
      4) Interfaces, interlocks
      5) IP address
      6) Entry telephone – primary and secondary numbers
2. Upon award of contract, request CAD release forms from TEECOM so that electronic files may be released for Contractor's use. TEECOM will release floor plans with devices; TEECOM will not installation details and block diagrams (Contractor shall develop their own diagrams and details for the shop drawings submittal package).

E. Format: Furnish submittal data in electronic copy including table of contents with each section bookmarked by specification section listing materials.

F. Label each submittal with the specification section number and provide a cover letter or stamp stating that the submittal has been thoroughly reviewed by Contractor and complies with the requirements of the contract documents. Failure to comply with this requirement will constitute grounds for rejection of the submittal.

G. Resubmittals: Provide a cover letter with the resubmittal that lists the action taken and revisions made to each product submittal in response to submittal review comments. Failure to include this cover letter will constitute rejection of the resubmittal package and no review will occur.

H. Drawings
1. Prepare shop and as-built drawings using software compatible with latest version of AutoCAD.

2. Drawing requirements:
    a. Sheet size: match the project's contract drawings size and use the project's title block
    b. Text size: minimum 3/32 inches high when plotted at full size
    c. Symbology: match the project's contract drawings symbols
    d. Backgrounds: screen background information to allow pertinent drawing information to stand out.
    e. Line Weights: Use appropriate line weights for devices, raceways, and text to stand out against background information.
    f. Floor Plans: 1/8 inch scale floor and site plans showing the locations of devices and cable routing paths with cable types and quantity called out.

I. Contractor Qualifications: Submit the following for review and comment at the beginning of the project.
1. Resumes of the project manager, general foreman, and lead technician(s) indicating role, years of experience, product certifications and training, listing of similar projects the individual performed the role proposed for this project along with client contact information for each.
2. Certification letters from manufacturers of major system components stating Contractor is an authorized reseller, installer, and extended warranty provider for the specified security systems.

J. Samples
1. Submit samples as required for proper coordination and installation of custom mounted equipment. Examples of samples that may be required include:
    a. Screen shots showing graphical floor plan maps indicating:
        1) Active functional icons
        2) Secure areas/zones
    b. Camera field of views

1.06 QUALITY ASSURANCE

A. General
1. Provide new and unused materials, equipment, and parts comprising the units specified herein of current manufacturer and of highest grade.
2. Only use products and applications listed in this Division on the project.

B. Bid Discrepancies
1. In the event of discrepancies within the contract documents, notify Engineer within 5 days prior to the bid opening to allow the issuance of an addendum.
2. If, in the event that time does not permit notification or clarification of discrepancies prior to the bid opening, the following applies: The drawings govern in matters of quantity, and the specifications govern in matters of quality. In the event of conflict within the drawings involving quantities, or within the specifications involving quantities, or within the specifications involving quality, the greater quantity and higher quality apply. Note such discrepancies and clarify

in the bid. We will make no additional allowances because of errors, ambiguities, or omissions, which reasonably should have been discovered during the preparation of the bid.

C. Substitutions
1. Conform to the general requirements and procedure outlined in Section 01 25 00 “Substitution Procedures”.
2. Where products are noted as “or equal”, a product of equivalent design, construction, and performance is considered. Include in the product data submittal: catalog cuts, product information, and pertinent test data required to substantiate that the product is in fact equivalent to that specified.
3. Only one substitution allowed for each product specified. Do not provide substituted material, processes, or equipment without written authorization from Engineer. Assumptions on the acceptability of a proposed substitution, prior to acceptance by Engineer, are at the sole risk of Contractor.
4. The burden of proof rest with Contractor that the substituted product is equivalent or better than the specified product. When Engineer accepts a substitution in writing, it is with the understanding that Contractor guarantees the substituted product, component, article, or material to be equivalent to the one specified and dimensioned to fit within the construction according to contract documents. Approved substitutions do not relieve Contractor of responsibilities for the proper execution of the Work, or from provisions of the Specifications.
5. Manufacturers' names and model numbers used in conjunction with materials, processes or equipment included in the contract documents are used to establish standards of quality, utility and appearance. Materials, processes or equipment that, in the opinion of Engineer, are equivalent in quality, utility and appearance will be approved as substitutions to that specified when “or equal” follows the manufacturers' names or model number(s).
6. Whenever material, process or equipment is specified in accordance with a Federal specification, an ASTM standard, an ANSI specification, UL rating or other association standard, present an affidavit from the manufacturer certifying that the product complies with the particular standard specification. When requested by Engineer, submit support test data to substantiate compliance at no additional cost.
7. Pay expenses, without additional charge to County, in connection with substitution materials, processes and equipment, including the effect of substitution on self, Subcontractor's or other Contractor's work.

D. Electronic Control Systems Contractor Qualifications
1. A current, active, and valid and C7 or C10 license registered with the Contractors State License Board (CSLB)
2. Minimum five years of experience in installation and service of access control, video surveillance, and intrusion detection systems
3. Minimum five completed projects similar to scope and cost
4. Evidence of technicians qualified for the work in the form of current manufacturer’s training certification

E. Materials
   1. Provide new materials and equipment without defects.
   2. Provide only specified products and equipment, or products and equipment that have been approved in writing.

F. Regulatory Requirements
   1. Work and materials to conform to the latest rules of National Board of Fire Underwriters wherever such standards have been established and to the regulations of the State Fire Marshal, OSHA and the codes of the governing local municipalities. Perform work under these specifications confirming to the most stringent of the applicable codes.
   2. Provide the quality identified within these specifications and drawings when codes, standards, regulations, etc. allow Work of lesser quality or extent. The contract documents address the minimum requirements for construction.

G. Drawings
   1. Layout: Follow the general layout shown on the Drawings except where other work may conflict with the Drawings.
   2. Accuracy: The Drawings show a diagrammatic representation of the system within the constraints of the symbology applied.
   3. Detail: The drawings do not fully represent the entire installation for the Security System. Drawings indicate the layout and location of control console(s) components, as well as location of security devices, i.e. card readers, door locks and contacts, and duress stations. The drawings do not show conduits, wire and cabling between every system component, equipment, or device.
   4. Complete the details necessary for point-to-point design. This allows Contractor to achieve desired results applying their own procedures and methods. Submit shop drawings for review prior to installation.

H. Role of Engineer
   1. During the construction phase of the project, Engineer will work with Contractor to provide interpretation and clarification of project contract documents, process and reply to relevant Requests for Information (RFI), and act as an interface between Contractor and County.
   2. County has retained Engineer's services to observe the work for general compliance with the contract documents.
   3. In summary, Engineer will perform the following specific services during the design phase:
      a. Review product submittals and shop drawings for general compliance with the contract drawings and specifications.
      b. Review changes as they arise, and confirm that the proposed solutions maintain the intended functionality of the system.
      c. Interpret field problems for County, and translate into understandable language.
      d. Review the testing procedures to confirm compliance with industry-accepted practices.

1.07 PERMITS AND INSPECTIONS

A. Obtain and pay for permits and inspections required for the work.

B. Furnish materials and workmanship for this work in conformance with applicable legal and code requirements.

C. Perform tests required herein, or as may be reasonably required to demonstrate conformance with the Specifications or with the requirements of legal authority having jurisdiction.

D. Obtain review from compliance officials responsible for enforcement of applicable codes and regulations to establish that the work is in compliance with requirements of reference codes indicated herein.

1.08 PROJECT MANAGEMENT AND COORDINATION SERVICES

A. Provide a project manager for the duration of the project to coordinate the security system work with other trades. Coordination services, procedures and documentation responsibility include at a minimum, the items listed in this section.

B. Review of Shop Drawings prepared by Other Subcontractors:
   1. Obtain copies of shop drawings for equipment and systems provided by others that require connections or interface with the security system work. Thoroughly review those shop drawings to confirm compliance with the interface requirements.
   2. Document discrepancies or deviations:
      a. Prepare memo summarizing the discrepancy.
      b. Submit a copy of the specific shop drawing, indicating via cloud, the discrepancy.
   3. Prepare and maintain a shop drawing review log indicating the following information:
      a. Shop drawing number and brief description of the system/material.
      b. Date of your review.
      c. Indication if follow-up coordination is required.

C. Scheduling: Prepare work schedules for each floor indicating the following information:
   1. Submittals
   2. Cable Installation
   3. SEC Equipment Build Out
   4. Device Installation/Terminations
   5. Programming
   6. Testing
   7. Training
   8. Other tasks included under the alternate work section of these specifications

D. Job Conditions
   1. Protection: Keep conduits, junction boxes, outlet boxes and other openings closed to prevent entry of foreign matter. Cover equipment, devices, and apparatus to protect them against dirt, paint, water, chemical or mechanical damage, before and during construction period. Prior to final acceptance, restore to original condition fixture, apparatus or equipment damaged including restoration of damaged factory applied painted finishes. Protect bright finished surfaces and similar items until in service. No rust or damage will be permitted.
   2. Supervision: Personally, or through an authorized and competent representative, supervise the work from beginning to completion and, within reason, keep the same foreman and workmen on the project throughout the project duration.

E. Weekly Status Reports: Prepare weekly status reports throughout the entire course of the project containing the following information:
   1. Current / up-to-date 2-week look ahead schedule
   2. Progress during prior week
   3. Work expected to be completed during the upcoming week
   4. Delivery dates for equipment
   5. Coordination status for each device requiring coordination with other subcontractors
   6. Summary of the information owed to Contractor, who is responsible for providing the information, and due date for the information

F. Weekly Meetings: Conduct or attend weekly coordination meetings with the electrical and other specialty subcontractors to coordinate the installation of the security systems.

1.09 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery
   1. Do not deliver security system components to the site until protected storage space is available.
   2. Replace equipment damaged during shipping and return to manufacturer at no cost to County.

B. Storage
   1. Store materials in a clean, dry, ventilated space free from temperature extremes. Storage outdoors covered by rainproof material (for example, a tarp) is not acceptable.
   2. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris, and traffic.
   3. Provide heat where required to prevent condensation or temperature related damage.

C. Handling
   1. Handle in accordance with manufacturer's written instructions.

2. Prevent internal component damage, breakage, denting and scoring. Do not install damaged equipment. Replace damaged equipment and return equipment to manufacturer.

1.10 WARRANTY

A. Provide the Security System as described in this specification with a one-year parts, software, labor and service warranty at no additional cost to County.

B. Include in the warranty package, at a minimum, the following:
   1. Emergency maintenance service on regular working hour basis
   2. Service by factory trained and employed service representatives of system manufacturer

C. Maintain regular service facilities and provide a qualified technician familiar with this work at the site within four hours of receipt of a notice of malfunction including weekends and holidays. Provide material, devices equipment and personnel necessary for repairs. Install approved temporary, alternate equipment if required by County, complete and operational within 24 hours after notification of a malfunction, at no additional cost.

D. Conduct warranty repairs and service at the job site unless in violation of manufacturer's warranty; in the latter event, provide substitute systems, equipment and/or devices, acceptable to County, for the duration of such off-site repairs. Transport warranty substitute and/or test systems, equipment, devices, material, parts and personnel to and from the job site at no additional cost.

E. Warranty period shall commence upon written final acceptance by County or County's designated representative.

1.11 MAINTENANCE

A. Extra Materials
   1. Deliver extra materials to a secured location determined by County.
   2. Provide a complete bill of materials listing quantities, part numbers, and descriptions for each device for County to sign indicating receipt of equipment.
   3. Provide new and unused spare parts in their original packing materials upon delivery.

B. Maintenance Service
   1. For the first year of service, conduct quarterly system performance review meetings to review system operation problems and/or defects that occurred during the preceding 3 months. During these performance review meetings, perform the following:
      a. Visual checks and operational tests of the central processor, local processors, monitors, keyboards, system printers, peripheral equipment, security

equipment and devices, power supplies, and electrical and mechanical controls.
b. Clean system equipment, including interior and exterior surfaces.
c. Perform diagnostics on equipment.
d. Check and calibrate each device.
e. Run system software and correct diagnosed problems.
f. Resolve previous outstanding problems.

2. Provide software and firmware updates issued free of charge by the manufacturer.

PART 2 - PRODUCTS

2.01 GENERAL

A. Material and equipment specified herein have been selected as the basis of acceptable quality and performance and have been coordinated to function as components of the included systems. Where a particular material, device, equipment or system is specified directly, the current manufacturer's specification for same is a part of these specifications, as if completely elaborated herein.

B. Remove manufacturer identification marks from visible equipment. Provide materials permanently labeled with the manufacturer’s name, model and serial number.

C. Use standard, regularly manufactured, materials and equipment for this and/or other similar systems, and not custom designed especially for this project. Provide systems and components thoroughly tested and proven in actual use. Provide subsystems of one manufacturer.

2.02 EQUIPMENT ENCLOSURES AND JUNCTION ENCLOSURES

A. Application: For indoor use to house panels and equipment, and to house terminations, relays, and other components local to controlled doors and other field devices

B. Type: NEMA type 1 enclosure

C. Description:
1. Solid steel enclosure with solid, continuous-hinged door
2. Finish: ANSI 61 gray polyester powder paint finish inside and out
3. Lockable / equipped with a lock kit (lock kits shall be keyed alike with other security enclosures throughout the project)
4. Perforated back panel within enclosure (for mounting control boards, relays, terminal strips, etc.)
5. One tamper switch per enclosure
6. One 5” electric fan with a screen at the port per enclosure that houses electrically-powered devices/equipment

D. Size:
1. For use as Security Equipment Enclosure: 36"L x 24"W x 6"D minimum

2. For use as Security Junction Enclosure: 12"L x 12"W x 6"D minimum

E. Manufacturer, or equal:
   1. Eaton Cooper B-Line
      a. #36246-1PP; 36"L x 24"W x 6"D enclosure with back panel and lock kit
      b. #12126-1PP; 12"L x 12"W x 6"D enclosure with back panel and lock kit
   2. Hoffman
      a. #A36N24M; 36"L x 24"W x 6"D enclosure
      b. #A36N24MPP back panel for 36" x 24" enclosure
      c. #A12N126; 12"L x 12"W x 6"D enclosure
      d. #A12N12PP; back panel for 12" x 12" enclosure
      e. # A612AR; lock kit
   3. Wiegmann
   4. SquareD

2.03 SLOTTED WIRING DUCT

A. For indoor use inside equipment enclosures to manage/mind wiring.

B. Description:
   1. Type: Lead-free PVC with narrow finger design
   2. Color: Light gray

C. Manufacturer, or equal:
   1. Panduit Type-F narrow slot wiring duct
   2. Iboco #T1-1010 wiring duct

2.04 WIREWAYS

A. For indoor use with equipment enclosures to manage and route wiring and cabling.

B. Type: NEMA type 1 screw cover ‘gutter’ wireway and accessories

C. Description:
   1. Wireways shall have open top assembly and closure plates/end caps (to secure end of wireway sections).
   2. Finish: ANSI 61 gray polyester powder paint finish inside and out
   3. Size: 4" x 4", minimum

D. Manufacturer, or equal:
   1. Eaton Cooper B-Line #4448-G-NK; lay-in painted wireway without knockouts
   2. Hoffman #F44T148GVP lay-in painted wireway without knockouts

2.05 INTERFACE RELAYS

A. Application: lock power switching and interfacing with other high-voltage powered equipment, i.e. gates, high-voltage locks, etc. (not for use at the output contacts on the access controllers since their rating is not adequate)

B. Type: Standard industry control, plug-in type with LED indicator lights to indicate when the relay is energized.

C. Contacts: Rated for 10 amps at 120VAC.

D. Coil Operating Voltage: as required, with 24VDC as first choice

E. Features:
   1. Color-coded test button
   2. Mechanical flag
   3. Snap-on label
   4. Pilot light
   5. 2mm test jacks
   6. Dual contact markings
   7. Snap-on number and letter markers
   8. Solid bus-bar socket construction

F. Relay bases shall be mountable on standard mounting rails

G. Manufacturer, or equal:
   1. Turck #Releco
   2. Idec

2.06 TAMPER RESISTANT HARDWARE

A. Tamperproof hardware shall be used in locations below 10' exposed to the public.

B. Hardware exposed in public spaces shall be pinned-allen type.

C. Hardware used in specialty metal surfaces shall have a similar finish color.

2.07 WIRE CONNECTORS

A. Wire connectors shall be heat activated, gel filled.

B. Twist and solder/taped or wire nut connections are not acceptable.

C. Manufacturer, or equal:
   1. Dolphin
   2. 3M Terminals
   3. Fastenal Sealed Crimp and Solder connector

PART 3 - EXECUTION

3.01 EXAMINATION

A. Conditions: Verify existing conditions, which have been previously provided under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

B. Pathways: Verify that pathways and supporting devices, which have been previously provided under other sections, are properly installed, and that temporary supports and devices have been removed.

C. Field Measurements: Verify dimensions of pathways, including length of pathways. For example, “True Tape” the conduits to verify cable distances.

3.02 FIELD QUALITY CONTROL

A. Staffing: Provide a qualified foreman who is in charge of the work and who is present at the job site at times work is being performed. Perform the work using skilled technicians under the direction of the foreman. Supervise the work force executing the work. Perform the installation within the restraints of the construction schedule. Do not change the supervisor during the project without prior written approval from County.

B. Inspection: Perform inspection after installation. Keep areas of work accessible and notify code authorities, or designated inspectors, of work completion released for inspection. Document completion, and inspection as required.

3.03 INSTALLATION

A. Perform this work in accordance with acknowledged industry and professional standards and practices and the procedures specified herein.

B. Provide a complete, operating system. Include devices specified including basic components and accessories, interconnecting wiring and other equipment and installation devices necessary for a complete system as specified.

C. System Password Management:
   1. Change default passwords on all devices, components, and systems.
   2. Create a base administrator account for County’s use/login.
   3. Install the latest security patches (for the operating system and each individual piece of equipment).
   4. Disable unused communication ports or protocols.
   5. Perform quarterly software security patch updates for the client during the warranty period.
   6. Contractor to turn over all source media including installation discs, manuals, drives, dongles, and licensing keys and codes.

D. Manufacturer's Instructions:
   1. Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.
   2. Maintain jobsite file of Material Safety Data Sheets (MSDS) for each product delivered to jobsite.

E. Boxes, Panels, and Enclosures
   1. Install boxes, panels, and enclosures square and plumb.
   2. Set flush-mounted units with the face of the cover, bezel, or escutcheon in the same plane as the surrounding finished surface.
   3. Mount boxes, panels, and trim so that there are no gaps, cracks, or obvious lines between the trim and the adjacent finished surface; ready them to receive final finish, as applicable.
   4. Install insulating terminations in signal circuit boxes, panels, wireways, or enclosures.

F. Painting
   1. Custom paint devices as indicated on the drawings.
   2. Paint exterior camera mount and housing to match adjacent surface. Submit color sample to architect for approval prior to proceeding with work.

3.04 REPAIR/RESTORATION

A. Replace or repair work completed by others that you deface or destroy, and at no cost to County.

B. Punch List:
   1. Inspect installed work and develop a punch list for items needing correction.
   2. Submit punch list to Engineer for review prior to performing punch walk with Engineer.

C. Re-Installation:
   1. Make changes to the system such that defects in workmanship are correct and cables and the associated termination hardware passes the minimum test requirements.
   2. Repair defects prior to system acceptance.

D. Painting: Repaint surfaces altered during installation of the security system to match previous conditions.

3.05 CLEANING

A. Remove temporary coverings and protection of adjacent work areas. Remove unused products, debris, spills, or other excess materials. Remove installation equipment.

B. Leave finished work and adjacent surfaces in neat, clean condition with no evidence of damage.

C. Repair or replace damaged installed products.

D. Legally dispose of debris in an environmentally friendly manner.

E. Clean installed products in accordance with manufacturer's instructions prior to County's acceptance.

END OF SECTION 28 00 00

SECTION 28 05 13

SECURITY SYSTEM CABLING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Cables and wires for security systems

B. Related Sections:
1. Consult other sections; determine the extent and character of related work and properly coordinate work executed under this section with that specified elsewhere to produce a complete and operable system.
2. Section 28 00 00, “Basic Security Requirements”
3. Section 28 05 53, “Security System Labeling”
4. Section 26 05 33, “Raceway and Boxes for Electrical Systems”
5. Section 27 05 43, “Underground Ducts and Raceways for Communications Systems”
6. Section 27 05 28, “Pathways for Communications Systems”
7. Section 27 15 13, “Horizontal Cable”

1.02 REFERENCES

A. Comply with the References requirements of section 28 00 00.

B. In additional to those codes, standards, etc., listed in section 28 00 00, products and work shall comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
1. NFPA 262, “Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces”
2. ANSI/UL 1666, “Test for Flame Propagation Height of Electrical and Optical-Fiber Cable Installed Vertically in Shafts”
3. ANSI/UL 1581, “Reference Standard for Electrical Wires, Cables and Flexible Cords”
4. UL 2196, “Standard for Tests of Fire Resistive Cables”

1.03 SUBMITTALS

A. Submittal Requirements at Start of Construction:
1. Product Data: Submit product information, including manufacturer, part number, description, use/application, jacket rating, outside diameter, etc.

B. Submittal Requirements at Closeout:
1. Include wire and cable types in As-Built Drawings
2. Include wire and cable information in O&M Manuals

1.04 SCOPE OF WORK

A. General: Provide engineering, labor, materials, apparatus, tools, equipment, transportation, temporary construction and special or occasional services as required to make a complete working security system installation as described in these specifications.

B. Cables for Security System
   1. Provide wires and cables sized to allow for less than 10% voltage drop of 12VDC and 24VDC power service from power supplies in equipment rooms to field devices.
   2. Provide cables effectively shielded for video signal cable within the same conduit to mitigate interference or signal noise.
   3. Provide plenum rated jacket (type CL2P, CL3P, or CMP) on cables installed indoors where required.
   4. Provide PVC or PE jacket, flooded cables to prevent water intrusion where installed outdoors, underground, and/or within slab-on-grade. Provide transition of outdoor/underground cables to indoor cables when entering a building.
   5. Provide surge protection when cables enter buildings from outdoors where required by NEC.

C. Cable Supports and Pathways for Security System Cabling
   1. Provide dedicated cable support for security cables when not within primary pathways (such as cable tray). Coordinate work with Division 27 – particularly for use of pathways/cable support.

PART 2 - PRODUCTS

2.01 INDOOR PLENUM MULTI-CONDUCTOR CABLES

A. Application: Indoor use, for ACAMS, VSS, SCS, and IDS

B. Type: multi-conductor or paired, unshielded and shielded

C. CL2P (plenum) rated

D. Manufacturers, or equal:
   1. Belden
      a. #6500UE; 22AWG/2C, unshielded
      b. #6502UE; 22AWG/4C, unshielded
      c. #1325A; 22AWG/2PR, individually shielded
      d. #6502FE; 22AWG/4C, overall shielded
      e. #6504FE; 22AWG/6C overall shielded
      f. #3004A; 22AWG/8C overall shielded
      g. #6300UE; 18AWG/2C, unshielded
      h. #6302UE; 18AWG/4C, unshielded
      i. #6302FE; 18AWG/4C, overall shielded

j. #6100UE; 14AWG/2C, unshielded

2. West Penn
   a. #25221B; 22AWG/2C, unshielded
   b. #25241B; 22AWG/4C, unshielded
   c. #D25510B; 22AWG/2PR, individually shielded
   d. #253241B; 22AWG/4C, overall shielded
   e. #253270B; 22AWG/6C overall shielded
   f. #253271B; 22AWG/8C overall shielded
   g. #25224B; 18AWG/2C, unshielded
   h. #25244Bl; 18AWG/4C, unshielded
   i. #253244B; 18AWG/4C, overall shielded
   j. #25226B; 14AWG/2C, unshielded
3. Windy City Wire
   a. 444362; 22AWG/2C, unshielded
   b. 444381; 22AWG/4C, unshielded
   c. 4150102; 22AWG/2PR, individually shielded
   d. 4443440; 22AWG/4C, overall shielded
   e. 444351-03; 22AWG/6C overall shielded
   f. 444352-08; 22AWG/8C overall shielded
   g. 442363; 18AWG/2C, unshielded
   h. 442384; 18AWG/4C, unshielded
   i. 442344; 18AWG/4C, overall shielded
   j. 447960; #6100UE; 14AWG/2C, unshielded

2.02 ENTRY TELEPHONE STATION CABLE

A. Application: intercom activation cable

B. Manufacturers, or equal:
   1. Westpenn #25244B; 18AWG/4C unshielded

2.03 IP CAMERA CABLE

A. Application: Suitable for indoor installation within conduit

B. Refer to Section 27 15 13 for product requirements.

2.04 MISCELLANEOUS COMPONENTS

A. Cable Ties:
   1. Width: 0.75 inches
   2. Color: Black
   3. Manufacturers, or equal:
      a. Panduit #HLS-15-R-0 Black, 15 feet roll, cut to length

PART 3 - EXECUTION

3.01 INSTALLATION

A. Cable Installation and Routing
   1. Install cables and wires continuously (splices will not be permitted without written approval from the Engineer) for the entire length of run between connections and/or terminations.
   2. Place and suspend cables within designated pathways, such as cable hangers, cable tray, etc. Do not fasten or attach cables (such as with cable ties) to other building infrastructure (such as ducts, pipes, conduits, etc.), other systems (such as ceiling support wires, wall studs, etc.), or to the outside of conduits, cable trays, or other non-approved pathway systems.
   3. Place and suspend cables during installation and termination in a manner to protect them from physical interference or damage. Place cables with no kinks, twists, or impact damage to the sheath. Replace cables damaged during installation or termination at no additional cost.
   4. Route cables at 90-degree angles, allowing for bending radius, along corridors for ease of access.
   5. Route cables under building infrastructure (such as ducts, pipes, conduits, etc.) so the installation results in easy accessibility to the cables in the future.
   6. Do not exceed manufacturer's limits for pulling tension.
   7. Do not use cable-pulling compounds for indoor installations.
   8. Dress and secure cables without stress and/or deformation. Dress and bind cabling with cable ties every 24” minimum. Within telecommunications spaces and covered wireways, provide Velco-style cable ties on security cabling.
   9. Install shielded wiring or route in separate raceways as recommended by the manufacturer's current requirements.
   10. Place cables a minimum of 6" away from power sources to reduce interference from EMI.
   11. Do not run signal wire and cable in parallel to power (120VAC).
   12. When connecting to screw-type barrier blocks, terminate wires with insulated crimp-type spade lugs. Size lugs properly to assure high electrical integrity, i.e., low resistance connections.
   13. Follow manufacturers recommended guidelines for installation.
   14. When exiting the primary pathway (such as cable tray) to the device, exit via the top of the pathway. Secure the cables to the pathway using an approved cable tie.
   15. When routing cables vertically in conduit for continuous distances greater than 30 feet, secure cables as the cables exit the vertical pathways. Secure cables using screw-flange nylon cable ties or similar approved ties. Provide symmetrical clamping devices with split, circular, or other wire conforming, nonmetallic bushings for coaxial cables.
   16. Within telecom rooms, route and dress cables on the overhead cable support and, when routing vertically, fasten the cables onto wall-mounted vertical cable support every 24 inches on-center using cable ties.

B. Cable Support
   1. Coordinate cable support work with sections 27 05 28 and 27 05 36 for indoor pathways such as cable hangers.
   2. Above ceilings, support cables at intervals no greater than 5 feet.
   3. Anchor cable support system/components to structure.
   4. Vertical Support on floor space, not in riser system
      a. Route cable from below suspended ceiling devices to above ceiling when possible.
      b. When routing cable in fire-rated wall assemblies, provide conduit and firestopping.
      c. When routing cable on concrete tilt up style walls from below ceiling devices to above ceiling, provide conduit – either surface or recessed (depending on wall construction).
      d. For cable routed vertically from devices with no suspended ceiling, provide conduit stub from device junction box to 14 feet, minimum, above finish floor.
   5. Vertical Support in riser system
      a. In vertical riser systems, route cable within conduit.
      b. Terminate conduit at each stacked closet in a lockable junction box. Size junction box as required per conduit size and quantity – 12" x 10" x 8", minimum.
      c. Support cables within the junction box at every other floor or approximately every 24 feet utilizing cable ties equipped with eyelets designed to accept screws for fastening or approved equivalent method.
   6. Label cables in accordance with section 28 05 53, “Security System Labeling”.

END OF SECTION 28 05 13

SECTION 28 05 53

SECURITY SYSTEM LABELING

PART 1 - GENERAL

1.01 SUMMARY

A. General: Furnish labor, materials, tools, etc., as required to complete security system labeling.

B. Section Includes:
   1. Labeling of wire, cable, security devices, enclosures, and raceways.

C. Related Sections:
   1. Consult other Sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.
   2. Section 28 00 00, “Basic Security Requirements”

1.02 SUBMITTALS

A. Product Data: Submit the following:
   1. Product information for components specified herein.
   2. List of equipment (wire, cable, devices, enclosures, and raceways) and the corresponding text for the label.

PART 2 - PRODUCTS

2.01 NAMEPLATES

A. Engraved, plastic laminated nameplates, signs, and instruction plates. Engrave stock melamine plastic laminate 1/16 inch minimum thickness for signs up to 20 square inches, or 8 inches in length; 1/8 inch thick for larger sizes. Use white letters for engraved nameplates and punch for mechanical fasteners.

2.02 WIRE AND CABLE LABELS

A. General:
   1. Self-laminating adhesive laser labels.
   2. Machine printable with a laser printer.
   3. Cable size: 0.16 – 0.32” OD
   4. Color: white with black lettering

B. Manufacturer, or equal:
   1. Brady #WML–211-295 and #WML-311-292 wire marking labels

2.03 DEVICE LABELS

A. Self-laminating, type on tape, adhesive labels. Use Helvetica 12 pt. text

PART 3 - EXECUTION

3.01 INSTALLATION

A. General Requirements:
   1. Label the security system components. The components include, but are not limited to, the following:
      a. Equipment Enclosures
      b. Conduits
      c. Security Devices
      d. Batteries
      e. Wires and Cables
      f. Equipment Racks
      g. Terminal Blocks
      h. Relays
      i. Patch panels, and the termination positions within the patch panels.
   2. Labels shall coincide with device IDs used on the record drawings.
   3. Degrease and clean surfaces to receive nameplates and labels.
   4. Install nameplates parallel to equipment lines. Secure nameplates to equipment fronts using machine screws.

B. Equipment Cabinets:
   1. Label SEC enclosures associated with the security system with a nameplate.
   2. Mount label on exterior of door, centered horizontally, and positioned one-third of the door height vertically from the top.
   3. Example: Line 1 [1/2 inch high letters]: “SEC-01”
      Line 2 [1/4 inch high letters]: “Security Equipment Cabinet”

C. Conduits:
   1. Write the destination for every conduit entering a junction box, SEC, and CEC enclosure, or wireway using a black permanent ink marker next to the conduit inside the box.
   2. Example: “To SEC-01”

D. Security Devices:
   1. Label devices associated with the security system with a permanent machine generated, laminated, label. Use 12 point Helvetica text with a clear background. Use white or black lettering depending upon the color of the device.
   2. Label each device in a concealed location with the system point number and address.

E. Batteries:
   1. Label power supply batteries with the month and year they were installed.

2. Example: "April 2016"

F. Wire and Cable
1. Identify wire and cable clearly with permanent machine-generated labels wrapped about the full circumference within 1 inch of each connection.
2. Indicate the cable ID designated on the associated field or shop drawings or run sheet, as applies.
3. Assign wire or cable designations consistently throughout a given system; i.e., each wire or cable to carry the same labeled designation over its entire run, regardless of intermediate terminations.
4. Provide labels where wire and cable first enter and exit from conduit, junction or distribution boxes; locate labels within 6 inches of the point of exit.
5. Positional labels so they are clearly visible without the need to remove wire management or other obstructions.
6. Label cables at both ends of a run and within pull and junction boxes using machine generated wrap-around labels.

3.02 CABLE LABEL FORMAT

A. Text: Helvetica font, 12 point (minimum size, unless otherwise specifically stated)

B. From Panel to Field Device
1. Line 1: Device Type and Device Number
2. Line 2: Panel ID – Port Number
3. Example: CR 001
PANEL 2 – CR5
4. Standard Device Types
a. CR = Card Reader
b. K = Camera
c. ET = Entry Telephone
d. R = Relay Output
e. A = Alarm Point
5. Standard Port Numbers
a. CR = Reader
b. M = Monitored Input
c. R = Relay Output

C. From Door Junction Box to Card Reader
1. Line 1: Device Type and Device Number
2. Line 2: Panel ID – Port Number
3. Example: CR 001
PANEL 4 – CR3

D. Miscellaneous Examples:
1. From Door Junction Box to Door Contact
a. CR001

b. DC
2. From Door Junction Box to Rex Alarm
   a. CR001
   b. REX ALM
3. From Panel to Rex
   a. CR001
   b. REX PWR
   c. 12 VDC
4. From Panel to Lock
   a. CR001
   b. LCK PWR
   c. 24 VDC

E. Communications Cable
1. Line 1: Communication Type and Direction
2. Line 2: Panel ID
3. Example: RS-485 TO
   PANEL 2
4. Typical Communication Types
   a. RS-485
   b. RS-232
   c. RS-422

END OF SECTION 28 05 53

SECTION 28 08 00

SECURITY SYSTEM ACCEPTANCE TESTING

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. General: Furnish engineering, labor, materials, apparatus, tools, equipment, and transportation required to test a completed security system installation as described in these and the related Specifications.

B. Base Bid Work:
   1. Comprehensive testing for all systems installed as part of the project in two distinct phases which includes:
      a. Functional Testing
      b. Acceptance Testing
   2. Produce and submit for review and approval the test results documentation for each of the two distinct phases of testing.

C. Related Sections:
   1. Section 28 00 00, “Basic Security Requirements”
   2. Section 28 05 13, “Security System Cabling”
   3. Section 28 05 53, “Security System Labeling”
   4. Section 28 13 00, “Access Control and Alarm Monitoring System”
   5. Section 28 16 00, “Intrusion Detection System”
   6. Section 28 23 00, “Video Surveillance System”
   7. Section 28 26 00, “Security Communications System”

1.02 SUMMARY OF ACCEPTANCE TESTING ACTIVITIES

A. Overview:
   1. The purpose of these testing activities is to ensure the security system operates properly and per the County’s requirements. Security systems are very complex from both an equipment and programming standpoint and thorough testing is necessary to ensure correct operation.
   2. Perform testing activities after-hours or on weekends when the system is not being actively utilized and the building is generally unoccupied. This will minimize the amount of irrelevant activity in the system activity reports that will be used as a record of the Functional Testing and Acceptance Testing test results documentation.

B. Functional Testing:
   1. Functional Testing represents a complete and documented test of the security systems. At a minimum, Functional Testing shall demonstrate proper operation of security system components, including: devices, sensors, switches, power supplies, controllers, input/output boards, relays, network communications,

tamper switches, initiating circuits, and associated accessories and appurtenances required for system functionality.

2. Perform Functional Testing of security systems to verify correct operation prior to scheduling the Acceptance Testing.
3. Document the results of the Functional Testing and submit to the Engineer along with system activity reports for approval.
4. Functional Testing test results documentation shall be reviewed and approved prior to scheduling the Acceptance Testing.

C. Acceptance Testing:
1. Acceptance Testing represents a final walk test with the Engineer and County to demonstrate proper operation of security system components including system integration, programming, operational capabilities, and functional performance.
2. Perform Acceptance Testing of the security systems in the presence of the Engineer and County to demonstrate fully functional and completely operational security systems.
3. Submit Acceptance Testing test results documentation and punch list/deficiencies corrections, prior to County approval of Substantial Completion and the start of the Warranty period.

1.03 SUBMITTALS

A. Functional Testing test results documentation submittal

B. Acceptance Testing test results documentation submittal

C. Operation and Maintenance (O&M) Manuals: Submit O&M Manuals for review and approval at the completion of the project consisting of the following:
1. Warranty letter: copy of Warranty letter reflecting start and end dates, and instructions covering warranty procedures.
2. Functional Design Manual: includes a detailed explanation of the operation of the system.
3. Hardware Manual, which includes:
   a. Pictorial parts list and part numbers
   b. Pictorial and schematic drawings of wiring systems including devices, control panels, instrumentation, and annunciators
   c. Telephone numbers for the authorized parts and service distributors
   d. Service bulletins
4. Software Manual, which includes:
   a. Use of system and applications software
   b. Initialization, start-up, and shut down procedures
   c. Alarm reports
5. Operator’s Manual, which fully explains procedures and instructions for the operation of the system and includes:
   a. Computers and peripherals
   b. System start up and shut down procedures

c. Use of system, command, and applications software
d. Recovery and restart procedures
e. Graphic alarm presentation
f. Use of report generator and generation of reports
g. Data entry operator commands
h. Alarm messages and reprinting formats
i. System access requirements
j. Service maintenance call procedures

6. Maintenance Manual, which includes:
   a. Instructions for routine maintenance listed for each component, and a multi-page summary of component's routine maintenance requirements
   b. Detailed instructions for repair of the security system
   c. A summary of the software licenses, including license numbers, quantity of clients, summary of the software options provided, and database capabilities
   d. A list of IP addresses used and with which system component they are associated, including MAC address
   e. A list of gateway addresses, subnet masks, DNS servers, and host name information
7. Test Results Manual which includes the document results of tests, required under this Specification, organized by System, Floor, and Door.
8. As-Built Drawings, which includes 11"x17" prints of the as-built drawings.

D. As-Built Drawings
1. Submit As-Built Drawings for review and approval at the completion of the project.
2. As-Built Drawings shall fully and accurately represent installed systems and conditions, including: actual locations of devices and components, actual cable and terminal block numbering, and actual wire routing and wiring (wire type, gauge/size, rating, etc.).
3. Record changes in the work during the course of construction on blue or black line prints. Transfer construction mark-ups to AutoCAD or Revit format drawings at the completion of the project.
4. Include the following additional information:
   a. Device addresses and IP address information
   b. Settings for each camera (lens specs, mm setting, auto shutter setting, and other available camera settings, etc.)
5. Include approved Shop Drawings.
6. Final acceptance requires the Engineer's approval of the As-Built Drawings.

E. County's acceptance, Substantial Completion, and start of the Warranty period requires all submittals above be approved and punch list deficiencies be corrected.

1.04 QUALITY ASSURANCE

A. Provide a project manager to coordinate the security system acceptance testing work with other trades.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 SCHEDULING

A. Coordinate the security system Functional Testing and Acceptance Testing acceptance testing specific activities into the overall project construction schedule.

B. Provide the Engineer and County with a minimum one week notice prior to scheduling Functional Testing and Acceptance Testing activities.

3.02 TESTING REQUIREMENTS

A. Site Tests
   1. At a minimum, security system testing requirements shall include the following tests (where applicable to the project):
      a. Building Perimeter Test: Test doors, cameras, and devices related to securing the perimeter of the building.
      b. MDF/IDF/SOC Test: Test devices related to securing the MDF and IDFs. Inspect system panels, power supplies, and other related security equipment located in these areas.
      c. Access Control System Test: Test the software for correct programming and setup. Verify correct integration with the Intrusion Detection System and Video Surveillance System.
      d. Alarm Event Pager Test: Demonstrate correct operation of the alpha-numeric pager to verity receipt of alarms generated by the security system.
      e. Video Surveillance System Test: Test the system for correct programming, operation, and alarm camera call-up.
      f. Video Recording System Test: Test the recording system for correct programming, alarm recording, and event retrieval. Verify correct integration with the ACAMS and IDS system for alarm call-up. Test and verify the system is viewable from client workstations.
      g. Intrusion Detection System Test: Test the network connection and alarm dialer and duress stations for correct programming and operation. Verify correct arming/disarming functions from each keypad. Verify integration with ACAMS and Video Surveillance System.

h.	Video Camera Test:	Review cameras for proper coverage, quality of video, focus, configuration, etc.
i.	Entry Telephone System Test:	Test entry telephone stations for proper communication, interface with door and gate systems, primary phone numbers, backup phone numbers, and alarm call-up.
j.	Other Readers/Door Test:	Test remaining card readers and doors not included in the above tests.
k.	Glass Break Test:	Test the glass break detectors for correct operation.
l.	Battery and UPS Load Test:	Disconnect AC power to security system equipment to verify battery operation functions and system remains fully operational.
m.	Door Hardware Test:	Coordinate with the Division 08 door hardware contractor to resolve electrified locking door hardware failures and door alignment or door closer problems.

B. Site Tests Preparation
   1. Provide device identification numbers that differ from or were not included on the original Construction Drawings.
   2. Provide a complete systems point list.
   3. Provide paper and toner for the printer so that an event log can be printed out and attached to the test reports as verification of test sequence and systems response.
   4. During testing, provide technicians familiar with the installation to assist with the test. Stage the technicians as follows: one at the host, one at the device being tested, and one runner responsible to furnishing tools, step ladders, etc.
   5. Provide radios for use by the Engineer and County during testing.
   6. Provide pre-programmed access cards for use during testing. Provide one authorized card for each access level. Provide one card with no access authorization. Provide keys for lockset mechanical key override.

3.03 TEST PROCEDURES

A. Follow manufacturer's written test procedures for each type of device and system.

3.04 FIELD DOCUMENTATION

A. Provide printed system documentation containing detailed wiring diagrams for each security equipment enclosure. Documentation shall include, at a minimum, layout of equipment, elevation detail, complete parts list, and complete wiring diagrams for each security system controller, input / output board, relay, and power supply.

B. Provide a printed service log for each security equipment enclosure. Service log shall include, at a minimum, columns for the following information: date of service, description of work performed, service technician(s), and service company.

C. Neatly fold the printed system documentation and service log and place it inside a clear plastic pocket affixed to the inside door of the security equipment enclosure.

3.05 TRAINING

A. Upon completion of the Acceptance Testing, provide training to the County's representatives, at times convenient to them, in the function and operation as well as the service and maintenance of the security systems.

B. Utilize the production database for the training to give the users project-specific examples from which to learn.

C. Provide 8 hours, minimum, of on-site training by a factory trained representative. Maintain a sign-in sheet with names and dates of persons trained and forward to County upon completion of training.

D. Provide for designated County’s representatives to attend off-site factory certification training for all systems installed as part of the project, including:
   1. Access Control and Alarm Monitoring System
   2. Video Surveillance System
   3. Intrusion Detection System
   4. Security Communications System

END OF SECTION 28 08 00

SECTION 28 13 00

ACCESS CONTROL AND ALARM MONITORING SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. ACAMS, including access control units, input/output units, and card readers
2. ACAMS power supplies
3. Alarm initiating devices, including: magnetic switch contacts, request-to-exit sensors, glass break detectors, and duress buttons
4. Power supplies
5. Local audible alarms/sounders
6. Interface to electric door hardware, ADA door operators, and gate operators
7. Interface to Fire/Life-Safety system
8. Interface to elevator controls
9. Interface to VSS, IDS and other security subsystems with bi-directional communication

B. Products Furnished but not Installed under This Section:
1. None

C. Products Installed but not Furnished under This Section:
1. Electrified locking hardware cable and termination to transfer hinge and security system

D. Products Specified but not Installed under This Section:
1. Access control devices inside elevator cabs, including card readers, interface relays, and reader modules.

E. Products Furnished and Installed under Another Section:
1. Existing AMAG access control server
2. 120VAC power
3. New electric feed-through power transfer hinges
4. Telecommunication pathways; refer to Section 27 05 28 and/or 27 05 32.
5. Network switches, with Power over Ethernet (PoE)

F. Related Sections:
1. Consult other Divisions, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a fully functional and completely operational system.
2. Section 08 71 00, “Door Hardware”
3. Section 26 XX XX, “Electrical”
4. Section 28 00 00, “Basic Security Requirements”
5. Section 28 05 13, “Security System Cabling”

6. Section 28 05 53, “Security System Labeling”
7. Section 28 08 00, “Security System Acceptance Testing”
8. Section 28 16 00, “Intrusion Detection System”
9. Section 28 23 00, “Video Surveillance System”
10. Section 28 26 00, “Security Communications System”
11. Section 28 31 00, “Fire Detection and Alarm”

1.02 REFERENCES

A. Comply with the References requirements of Section 28 00 00.

B. In addition to the codes and standards listed in Section 28 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
   1. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
      a. UL 497, “Protectors for Paired-Conductor Communication Circuits”

1.03 DEFINITIONS

A. Definitions as described in Section 28 00 00 shall apply to this Section.

B. In addition to those definitions in Section 28 00 00, the following list of terms as used in this specification defined as follows:
   1. “A” and “AMP”: amperes
   2. “ACAMS”: access control and alarm monitoring
   3. “IDS”: intrusion detection system
   4. “KVM”: Keyboard, Monitor, Mouse (as in KVM drawer to access a server)
   5. “LAN”: Local Area Network
   6. “NC”: Normally closed
   7. “NO”: Normally open
   8. “REX”: request to exit
   9. “SCS”: security communications system
   10. “UPS”: uninterruptable power supply
   11. “VAC”: volts alternating current
   12. “VDC”: volts direct current
   13. “VMS”: video management system
   14. “VSS”: video surveillance system

1.04 SYSTEM DESCRIPTION

A. General: Provide engineering, labor, materials, apparatus, tools, equipment, transportation, temporary construction and special or occasional services as required to make a complete working Access Control and Alarm Monitoring system installation, as described in these specifications.

B. Access Control and Alarm Monitoring System (ACAMS) Overview
   1. ACAMS is a distributed network of control panels connected to and programmed from a central server and client workstation(s). The ACAMS is utilized for electronically controlling access within the building for employees, visitors, delivery personnel, and persons.
   2. ACAMS consists of an existing AMAG server/host computer, field panels, card readers and alarm initiating devices (refer to the drawings for locations of field panels, card readers, and other devices). The server will communicate with the control panels via the County's LAN and/or hardwire connections. The control panels control the electronic door hardware allowing or disallowing passage through a controlled door or gate.
   3. The ACAMS does not includes security or video badging workstations for this project.
   4. The ACAMS will provide secondary monitoring of the IDS.

C. ACAMS Server and Software
   1. Server (to host ACAMS software): Existing County AMAG system
   2. ACAMS Software: Provide ACAMS software package and licenses in a quantity sufficient to support the project's card readers +20% (minimum, round up to nearest whole number), including loading onto the existing ACAMS server, integrating into the network, programming the software system to meet the project requirements, and loading card readers, input points, output points, alarm notifications (email, pages, etc.), and other aspects of the system.
   3. Provide software interface to the VSS platform. Program ACAMS software such that alarm events (e.g., door forced open, door held open, etc.) make the video associated with that alarm device call up onto the main monitor and to mark the video recording.
   4. Provide interface to the IDS. Program ACAMS software to receive alarm events from the IDS for bi-directional monitoring.

D. ACAMS Panels and Power Supplies
   1. Provide access control panels, including enclosures, wireway, enclosures, wiring duct, panels, daughter boards, wiring, connectors, and other components for a complete system.
   2. Provide input and output modules as required to fulfill the project's requirements.
   3. Provide power supplies for power to ACAMS panels, field devices, door locks, motion detectors, indicator lamps, etc. Provide separate power supplies dedicated for lock power. Other devices such as REX's and alarm horns may be combined on common power supplies.
   4. Provide battery backup for power supplies and system components.
   5. Provide tamper switches within each security equipment enclosure and wireway, each security junction box, and each door junction box. Program ACAMS for monitoring and alarming (unsupervised inputs for this purpose).
   6. Provide real-time monitoring of power supplies and batteries. Connect power supplies to ACAMS panel as an input. Program ACAMS for monitoring and alarming (unsupervised inputs for this purpose).

E. Card Readers / Door Devices
   1. Provide multi-technology card readers, including rough-in, wiring, reader, and other components for a complete system and connect to the ACAMS. Provide tamper switches per card reader wired/connected to the ACAMS input module.
   2. Provide door contacts and request-to-exit motion detectors for card reader controlled doors and connect to the ACAMS. Refer to drawings for configurations and instances.
   3. Provide door contacts for non-card reader controlled doors noted on drawings (such as ground floor perimeter doors) and connect to the ACAMS. ACAMS shall monitor these doors. Program the ACAMS to alarm should the monitored doors open when not authorized.

F. Local Alarms
   1. Provide local audible alarms at locations noted on the drawings and connect to the ACAMS. Local audible alarms shall sound (alarm mode) when the associated door is either held open or opened when not authorized. The ACAMS shall monitor the station keyswitch and provide the ability for remote reset. Program the ACAMS and VSS to call up video upon alarm.

G. Provide end of line resistors as required (e.g., on supervised lines).

H. Provide interface to ADA automatic/power assist door operator and corresponding actuator push plates

I. Fire/Life-Safety System Interface
   1. Coordinate with Fire/Life-Safety system contractor to automatically drop power from stairwell, elevator vestibule lobby, and other doors within the path of egress upon alarm activation of the Fire/Life-Safety system.
   2. Coordinate with Fire/Life-Safety system contractor for scheduled release of electromagnetic door holders on designated card reader doors or scheduled unlocked doors as indicated on project drawings. Provide ACAMS output modules as necessary to interface with Fire/Life-Safety system to release electromagnetic door holders on doors that are required to close and lock on scheduled events.
   3. Provide emergency door release pull stations with double pole, double throw contacts located in elevator vestibule lobbies as indicated on project drawings. First set of contacts to break power to electrified door hardware on adjacent card reader door. Second set of contacts to connect with ACAMS. Provide ACAMS input modules as necessary to monitor status of emergency door release pull stations.

J. Elevator Interface
   1. Provide card readers at elevator hall call locations as shown on the drawings. Call station card readers shall activate call buttons and control access to elevator cab
   2. Provide interface between ACAMS and elevator controls. Program ACAMS with elevator interface based on the County's access level policy.

K. Extra Materials
   1. Furnish 10% spare parts of total installed the following (round up to the next complete device):
      a. Access controller boards
      b. Input expansion modules
      c. Output expansion modules
      d. Reader interface modules
      e. Card readers
      f. Power supply boards
      g. Relays
   2. Fuses: 5 of each type of fuse

1.05 SUBMITTALS

A. Quantity: Furnish quantities of each submittal as noted in Section 28 00 00.

B. Contractor Qualifications: Submit certification letters for the manufacturer of the ACAMS.

C. Product Data: Submit product information for components specified herein.

D. Shop Drawings: Include the following, minimum:
   1. Device placement on floor plans and RCPs
   2. Point-to-Point Diagrams: Include wiring, points of connection and interconnecting devices between the following:
      a. ACAMS control panel
      b. ACAMS card reader and input/output modules
      c. ACAMS power supplies
      d. Card Readers
      e. Door and lock position monitoring contact switches and request-to-exit sensors
      f. Glass break sensors
      g. Local audible alarms
      h. Interface to electrified door hardware
      i. Interface to Fire/Life-Safety system
      j. Interface to elevator controller
      k. Cable conductors (identify conductors on the point to point diagrams with the same tag as the installed conductor)
      l. Miscellaneous control relays
   3. Block Diagram/Riser Diagram: Show ACAMS components, conduit, wire types, and sizes between them, including cabling interties between termination hardware.
   4. Schedules: Include schedules for ACAMS control panels that show each point ID with a description of the connected devices
   5. Include user interface graphics with icons and control buttons displayed.
   6. Include custom mounting details.

E. Submittal Description: Training Submittal
   1. Format: PDF
   2. Contents:
      a. Cover sheet, showing:
         1) County Name
         2) Project Name and Address
         3) Project Submittal Number
         4) Submittal Name
         5) System Name
         6) Specification Section Number (e.g., "Section 281300")
         7) Date of Submittal. Format: Month Day, Year (e.g., "January 1, 2016")
         8) Contractor Name
      b. Table of Contents
      c. Training Schedule
      d. Training Course outline/ agenda
      e. Course materials and training manuals for the following users as applicable:
         1) System Administrator
         2) Security staff
         3) Operator, and nurse/staff.

F. Submittal Requirements at Closeout:
   1. As-Built Drawings: submit as-built drawings that includes approved block diagram, riser diagram, wiring diagram, security control room layout and elevations, floor plans, and reflected ceiling plans showing device locations.
   2. O&M Manual: submit O&M Manual as a binder or soft copy (bookmarked PDF) including the following, at a minimum:
      a. Product data – approved submittals ('cleaned up') and electronic
      b. As-built drawings, printed to 11x17 / tabloid landscape and electronic PDF files and native files (DWG or RVT) on storage media
      c. Warranty statement and service protocol (guidelines, contact numbers, etc.)
      d. Maintenance requirements
      e. Station Matrix, printed to 11x17 / tabloid landscape and electronic PDF files and native XLSX file on storage media
      f. Include information for the network switches and ports.

1.06 WARRANTY

A. Warrant work and the system to perform as described within this Section for a period of one year from the date of system acceptance. The warranty shall cover system operation/performance, parts, and labor. During the warranty period, respond within 4 hours and correct deficiencies within 24 hours of notification.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Access Control and Alarm Monitoring System
   1. AMAG Technology, Inc.
   2. No approved equal

B. Card Readers
   1. HID SE

2.02 ACAMS SERVER

A. The project will be supported utilizing the existing AMAG server. Upgrade software and hardware as required to support the project requirements.

2.03 ACAMS SOFTWARE PACKAGE AND CLIENT WORKSTATION SOFTWARE

A. Provide three client software workstation licenses and install them on Owner designated laptops/devices.

B. Software Package shall integrate with the VSS (refer to 282300).

C. Manufacturer and System:
   1. AMAG Symmetry
   2. No approved equal

2.04 SECURITY EQUIPMENT ENCLOSURES AND DEMARCATION ENCLOSURES

A. Refer to 28 00 00 for product requirements.

2.05 SLOTTED WIRING DUCT

A. Refer to 28 00 00 for product requirements.

2.06 WIREWAYS

A. Refer to 28 00 00 for product requirements.

2.07 POWER SUPPLIES/BATTERY CHARGERS

A. Power supplies shall be UL Listed and suitable for the purpose of powering ACAMS controllers, reader boards, intrusion detection panels, electric locks, and field devices (such as REXs, local alarms, etc.). Power supplies shall also be suitable for continuous charging of batteries (for power back up).

B. Description / Features:
   1. Input: 120 VAC, hard-wired

2. Output: sixteen 12 VDC and/or 24 VDC, 10 A continuous current, PTC Class 2 rated power limited
3. Fire alarm disconnect, individually selectable per output
4. Short circuit and thermal overload protection
5. Fail Safe and/or Fail Secure power outputs, individually selectable per output
6. LEDs indicate outputs triggered
7. Integrated battery charger
8. Monitor loss of input power and alarm in the Access Control System
9. Manufacturers, or equal:
    a. Altronix MAXIMAL Series; 12 VDC and 24 VDC dual power supply
    b. Or approved equal

2.08 BATTERIES

A. Batteries shall be UL Listed and suitable for the purpose of backing up power to security system equipment, field devices, electric locks, etc.

B. Description / Features:
1. Voltage: 12 VDC
2. Amps: 12 A
3. Chemistry: SLA or VRLA
4. Termination: Spade protected terminals

C. Manufacturer, or equal:
1. Interstate Batteries #SLA1105 sealed lead acid 12V 12Ah battery
2. Yuasa Battery Inc #RE12-12 sealed lead acid 12V 12Ah battery

2.09 ACCESS CONTROLLERS

A. Description / Features:
1. An intelligent controller with integrated battery backup, database, and communication ports that supports 16 or 32 card readers
2. Supports HID proximity, MIFARE, and DESFire card reader formats
3. Expansion capacity/additional modules (e.g., for additional memory and/or for future feature enhancements)
4. Supports flash upgrades for firmware updates
5. Global input/output and anti-passback functionality
6. Capable of utilizing keypad commands to activate/deactivate events
7. Monitor Inputs: Station switch, tamper, power fail, and alarm

B. Functions:
1. Central control for attached devices
2. Makes decisions for access
3. Responds to monitor activity
4. Receives input to control its decision making
5. Reports activity to other devices

C. Mounting: within wall mounted NEMA enclosure

D. Power:
   1. Main Power Source: controller shall be powered from the associated power supply unit
   2. Battery Backup: the controller board shall have an integrated low voltage battery (such as a lithium cell) to maintain internally stored database and setup in case main power is interrupted

E. Self-Protection: Controller shall detect power input failures and tampering

F. Communications
   1. TCP/IP via 10Base-T/100Base-TX
   2. Supports multiple communication channels to which a variety of devices can connect – RS-485, RS-422, or 20mA communications to addressable modules:
      a. Input Module: Supports 16 Class A supervised input points
      b. Output Module: Supports 16 Form C dry contact relays
      c. Reader Interface Module: Supports 8 card readers with associated alarm contacts, request-to-exit devices, and lock outputs

G. Manufacturer:
   1. AMAG Technology "Symmetry" series
      a. #M2150; database unit
      b. #CAB-4; enclosure
      c. #M2150-AC24/4; input module
      d. #M2150-OC4/24; output module
      e. #M2150-4DC; four-reader interface module
      f. #M2150-8DC; eight-reader interface module
      g. #MN-NIC-4; network interface module

2.10 MONITOR INPUT/RELAY OUTPUT BOARDS

A. Description
   1. Monitor Input: module that monitors inputs that occur over network and sends them via RS-485 protocol to the Controller.
   2. Relay Output: executes relay commands received from the Controller via RS-485 protocol.
   3. Monitor Inputs: 8, minimum, four-state monitor points
   4. Relay Outputs: 8, minimum, normally opened (NO) or normally closed (NC)

B. Manufacturer:
   1. Input Module:
      a. AMAG #M2000 I/O (input/output module)
   2. Output Module:
      a. AMAG #M2000 I/O (input/output module)

2.11 CARD READERS

A. Description / Features:
   1. FCC and CE certified, and conform to the following ISO standards:
      a. 15693 (CSN read-only)
      b. 14443A (CSN read-only)
      c. 14443B (CSN read-only)
   2. Capable of reading the following frequencies and card formats:
      a. 125 kHz and 13.56 MHz
   3. Utilize a Wiegand protocol for communication for compatibility with standard access control systems.
   4. Multi-color LED and an audible sounder to indicate the status of the door
   5. For exterior locations, reader shall be fully weatherized with a rugged, polycarbonate enclosure, designed to withstand an operating temperatures of -22 to 150 degrees Fahrenheit (-30 to 65 degrees Celsius) and operating humidity of 5-95% non-condensing.

B. Functions:
   1. Card reader shall continuous emit radio radiation with a continuous sensing of an access card.
   2. Upon reading an access cord, the card reader shall initiate a single transmission to the ACAMS controller.
   3. Upon receiving status from the ACAMS controller, the card reader shall change the state of the LED to the programmed state.

C. Manufacturer, or equal:
   1. HID multiCLASS series
      a. Wall mount: HID SE Series; multi-technology card reader
      b. Mullion style: HID SE Series mullion; multi-technology card reader

2.12 MAGNETIC CONTACT SWITCHES

A. Magnetic contact switches shall be UL 634 Listed.

B. Wood, Steel, and Hollow Metal Doors
   1. Description / Features
      a. Mounting: Recessed
      b. Switch Type: Double Pole, Double Throw
      c. Gap Distance: 0.5” maximum
   2. Manufacturer, or equal:
      a. Interlogix #1078C; 3/4" dia., closed-loop contact switch, with leads
      b. Magnasphere #MSS-19CL; 3/4" dia., open loop contact switch, with leads
      c. Magnasphere #HSS-L2C; UL 264 Level 2 high security recessed contact switch, with leads

C. High Security Doors
   1. Description / Features
      a. Mounting: Surface
      b. Switch Type: Double Pole, Double Throw
      c. Gap Distance: 0.5” maximum
      d. Utilizes three independent Form C biased reed contacts
      e. Supervised loop with magnetic tamper feature
   2. Manufacturer, or equal:
      a. Interlogix #2707A-L high security contact switch
      b. Magnasphere #HSS-L2S-000; UL 634 Level 2 surface mount contact switch, with leads

D. Roll-Up Doors
   1. Description / Features
      a. Mounting: Surface
      b. Switch Type: normally closed
      c. Gap Distance: 3.0” maximum
      d. Wiring: Armor Cable, 36” minimum
   2. Manufacturer, or equal:
      a. Magnasphere #MSS–105S; overhead door contact
      b. Sentrol #2205A; floor mounted closed-loop contact switch with 3’ armored cable lead
      c. Sentrol #1949-L; floor mount bracket
      d. Sentrol #1912-L; aluminum L-bracket

2.13 REQUEST-TO-EXIT SENSORS

A. General
   1. Power: 12 or 24VDC, 35mA
   2. Relay Output: 2 form “C” contacts
   3. Adjustable relay latch time
   4. Programmable retrigger or non-retrigger mode
   5. Radio Frequency Interference (RFI) Immunity range from 26 to 1,000 MHz at 50 v/m

B. Manufacturer, or equal:
   1. Bosch #DS160 with TP160 trim plate
   2. Honeywell #IS320WH with IS310WHTP trim plate
   3. Interlogix #RCR-REX motion sensor REX

2.14 LOCAL AUDIBLE ALARMS

A. Description / Features
   1. Panel operating voltage selectable 12 or 24VDC at 150mA
   2. Keyswitch operation using rim cylinder provided by County to match existing standard

3. Integrated horn, 80 dB SPL
4. Input points for door switch, alarm shunt, door status, tamper switch, and key switch override
5. Output points for door propped alarm, intrusion alarm, door status, tamper switch, and key switch override
6. Tamper switch to detect the removal of the unit from the electrical back box

B. Manufacturer, or equal:
1. Designed Security Inc #4200-K3; local alarm sounder

2.15 DURESS BUTTONS

A. Under-Counter
1. Description / Features
a. Actuating lever, housing, and cover plate made of ABS fire-retardant plastic
b. Latching circuit with integrated LED
c. Switch Type: normally closed
d. Operating Voltage: 12VDC
2. Manufacturer, or equal:
a. Ademco #269R; hold-up switch
b. Interlogix #3040; panic switch

2.16 TERMINAL BLOCKS

A. Terminal blocks/modular terminal strips shall be suitable for inside equipment enclosures/junction boxes for demarcation of elevator traveler and security cabling.

B. Description:
1. Push-in style bridging system that utilizes the IDC termination method
2. DIN rails mounting (standard 35mm)
3. Feed through style, single level

C. Manufacturer, or equal:
1. Phoenix Contact #QTC-1,5 terminal block and #NS-35/7,5 DIN rail
2. ABB Entrelec feed through terminal blocks
3. Weidmuller P-Series feed through terminal blocks

2.17 INTERFACE RELAYS

A. Refer to section 28 00 00 for relay product requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General
1. Install equipment per manufacturer’s instructions.

2. Install devices, stations, etc., square and plumb. Set flush-mounted units so that the face of the cover, bezel, or escutcheon matches the surrounding finished surface.
3. Install so that there are no gaps, cracks, or obvious lines between the trim and the adjacent finished surface.
4. Install to heights shown on drawings. Heights shall comply with applicable ADA requirements.
5. Provide supervisory and end of line resistors as required.

B. ACAMS Software Package
1. Install necessary client access licenses and program per Owner's direction.
2. Upgrade ACAMS software package on the existing ACAMS server and integrate the software onto the network. Coordinate with the County's IT department for network integration and other IP-related requirements.

C. ACAMS Control Panels (Reader Board, Input/Output Boards)
1. Install security equipment enclosures and wireway per approved shop drawings.
2. Ensure cuts, knock-outs, punches, etc. have no sharp edges.
3. Install power supplies and associated hardware in same location.

D. Card Readers
1. Install card reader to the rough-in, not directly to dry wall.
2. Connect readers directly to reader boards. Do not daisy chain readers together.
3. Cable Requirements:
   a. 6-conductor 22 AWG stranded shielded cable for signal.
   b. 1-pair 22AWG stranded shielded cable for device power.
4. Wire the card reader's multi-color LED to indicate the following status of the door.
   a. Red = the door is secure (locked).
   b. Green = the door is unsecured (unlocked).
   c. Yellow = the card reader is not functioning (off-line/trouble), is processing a read request, or has denied access.
5. Wire/program the card reader to produce an audible beep tone to indicate to the user:
   a. The card was read and/or access was denied.
   b. Door is being held open and needs to be closed.
6. Enable optical tamper using configuration card. Wire the card reader's optical tamper to spare input on the ACAMS reader module and jumper ground wire from door contact to provide a normally closed circuit.

E. Four-State End-of-Line (EOL) Supervision
1. Provide designated resistors at device end of line per manufacturer's EOL recommendation to provide four-state supervision of security device and cabling.
2. Provide EOL supervision for alarm contacts, local alarm sounders, REXs, motion detectors, glass break detectors, help/duress buttons, and other designated security devices connected to the ACAMS and IDS.

3. Program ACAMS with the following states of supervision:
   a. Contact closed = Secure
   b. Contact open = Alarm
   c. Short circuit = Line fault
   d. Open circuit = Line fault
4. All NO/NC circuits shall be wired NC.

F. Door Hardware
1. Setup and conduct a door hardware coordination meeting.
2. Coordinate the installation and termination of the security cable with the installation of the electric door hardware and transfer hinge.
3. Route power to electrically controlled locks on Life-Safety doors through fire alarm output to automatically unlock the door upon activation of Fire/Life-Safety system. Connect fire alarm output to the disconnect relay on the associated 24VDC lock power supply.
4. Provide cable and terminate wires to delayed egress devices for monitoring activation of delayed egress by the ACAMS system.

G. Door Contacts
1. Install 6” from latch side of door.

H. Duress Buttons
1. Coordinate with architect and casework contractor to field determine exact placement of duress buttons prior to installation.

I. Request-To Exit Motion Detectors
1. Install motion detector on the secured (protected) side of door. Install so that its detection pattern is not obstructed by exit signs, light fixtures or other objects that would interfere with proper operation.
2. Adjust relay hold time and pattern to properly detect valid exit and allow shunting of door contact.
3. Adjust detection sensitivity to pulse.
4. Mask detector lens to provide a confined detection area limited to the door handle or push bar.
5. Run wire inside structural tube steel frame into back of conduit body for cage locations.

J. Low voltage transformers
1. Install low voltage transformer in security junction box to prevent tampering. Coordinate with Division 26 for location of outlet in junction box.

3.02 PROGRAMMING

A. Prior to the completion of construction, schedule a meeting with the County to determine the programming criteria. Document the results of the meeting and perform necessary programming to achieve the County's requests. During the meeting, discuss the following:
   1. Access card levels and door groupings
   2. Alarm priority levels
   3. Schedules and time codes
   4. Holidays and holiday types (priorities)
   5. Action/responses from individual input points
   6. Standard and custom (expanded) reports
   7. Defining alarm messages and standard response messages applicable to site
   8. Routing of alarm points to selected pagers
   9. Routing of alarm points to operator's workstations, printers, and history files
   10. County's graphics – develop sample graphic complete with icons and text. Alarms to appear on building floor plans depicting the nature and location of alarms. Review and revise graphic layout as required by County.
   11. System database backup procedures
   12. Video integration camera call-up

B. Program and setup the system such that no additional programming other than entering new access cards is required. Include setup of available features of the software.

C. Import County's cardholder database.

D. Using CAD drawing files of floor plans, perform the following relative to system graphics:
   1. Delete non-applicable drawing layers and details to arrive at simple floor plans of the building as built.
   2. Convert drawings to a graphic file format compatible with the County's access control and alarm monitoring system.
   3. Load drawing files into the system.
   4. Apply new and predefined icons and other points on each graphic to indicate point and control status.
   5. Link graphic images/icons to represent reader, monitor, alarm initiating devices, and control points.
   6. Program device icons on plans with functionality.
   7. Create camera call-up events.
   8. The point names shown on the as-built drawings shall match the system point schedule.

E. Program ACAMS such that alarm events generate email notification to offsite addresses via the Internet. Also, as required by the County, program ACAMS such that alarm events generate pages.

F. Program customized client workstation log-ins (restrict functions by user privileges).

G. Program routing of monitor and control points. Route activations and restore messages to one or more of the following locations as directed by the County's Representative:
   1. One or more system workstations
   2. One or more system printers
   3. One or more alphanumeric pagers
   4. History files in addition to the above
   5. History files only

H. Program the system such that reliance on a remote host for routine building operations, such as scheduled door commands and conditional events, are minimized to the greatest extent possible and decisions are made at the local building controller.

I. System Operation, Alarm and Reporting Function: Program door control panel tamper switches to immediately report as a separate "tamper" point to the system resulting in an alarm condition displayed in both text and graphic form on the applicable workstation(s) and an alarm message transmitted to the appropriate pager(s).

J. Program the system in a manner that minimizes the amount of time required for the users to make updates and maintain the system on a daily basis especially updates that impact card holder record updates. Nested programs, such as reader groupings used in access codes, shall be used to the greatest extent possible such that single actions are required to update an entire card data population. If there is a question regarding the appropriate approach to programming, given the flexibility of most systems, contact the Engineer prior to any initial programming

K. Perform 2 full system back-ups at completion of initial programming and deliver one copy to County with letter of Transmittal explaining information included in back-up and brief description of recovery procedures. Label the second removable storage device and store onsite. Perform back-ups on a regular basis through the remainder of the project.

L. Customize menus with the assistance of the factory to "gray-out" features not used on project (such as elevator control).

M. Perform field software changes after the initial programming session to "fine tune" operating parameters and sequence of operations based on revised operating requirements.

N. Password management – refer to Section 28 00 00.

3.03 EXTRA MATERIALS

A. Furnish extra materials to County. Produce a transmittal with an itemized list including quantities, recipient, and receipt date. Submit copy of County-signed transmittal with project closeout documents.

B. Place fuses inside each equipment/panel and power supply enclosure.

C. Turn over keys (equipment enclosures, low voltage power supplies, security junction boxes, rack cabinets, etc.) to the County. Produce a transmittal with an itemized list of keys, recipient, and receipt date. Submit copy of County-signed transmittal with project closeout documents.

3.04 TRAINING

A. Combine training on the ACAMS with training on the IDS (Section 28 16 00) and the VSS (Section 28 23 00).

B. Training Requirements
   1. Security Staff/System Operators:
      a. Prior to the first day of business at the new facility, provide of training, 4 hours per day.
      b. Three weeks later; provide 2 days of training, 4 hours per day.
   2. Administrators:
      a. Prior to the first day of business at the new facility, provide one day of training, 4 hours per day.
      b. Three weeks later; provide 2 days of training, 4 hours per day.

3.05 TESTING

A. Test ACAMS in accordance with Section 28 08 00.

END OF SECTION 28 13 00

SECTION 28 16 00

SECURITY INTRUSION DETECTION SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Intrusion Detection System
   2. Glass break detectors, motion sensors, door contact switches, keypads
   3. Duress alarm stations
   4. Interface to other security systems with bi-directional communication

B. Products Furnished but not Installed under this Section:
   1. None

C. Products Installed but not Furnished under this Section:
   1. None

D. Products Specified but not Installed under this Section:
   1. None

E. Products Furnished and Installed under another Section:
   1. 120VAC power
   2. Analog phone line (for alarm dial out)
   3. Network Connection (LAN / IP network / switches)

F. Related Sections:
   1. Consult other Divisions, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.
   2. Section 28 00 00, “Basic Security Requirements”
   3. Section 28 05 13, “Security System Cabling”
   4. Section 28 05 53, “Security System Labeling”
   5. Section 28 08 00, “Security System Acceptance Testing”
   6. Section 28 13 00, “Access Control and Alarm Monitoring System”
   7. Section 28 23 00, “Video Surveillance System”

1.02 DEFINITIONS

A. Definitions as described in Section 28 00 00 shall apply to this section.

B. In addition to those Definitions of Section 27 00 00, the following list of terms as used in this specification defined as follows:
   1. “A” and “AMP”: amperes (electrical current)
   2. “ACAMS”: access control and alarm monitoring system

3. "IDS": Intrusion Detection System
4. "LAN": local area network
5. "LCD": liquid crystal display
6. "REX": request-to-exit
7. "VAC": volts alternating current
8. "VDC": volts direct current
9. "VSS": Video Surveillance System

1.03 SYSTEM DESCRIPTION

A. General: Provide engineering, labor, materials, apparatus, tools, equipment, transportation, temporary construction and special or occasional services as required to make a complete working intrusion detection system installation, as described in these specifications and shown on the associated drawings.

B. System Overview:
   1. The IDS is a network of distributed control panels and monitoring devices covering multiple areas that can be armed and disarmed independently of each other (alarm zones). Though interconnected, the IDS is a separate system from the ACAMS and is utilized for monitoring the building perimeter and designated interior spaces and for generating alarms.
   2. The IDS consists of control panels, communicators, zone expanders, keypads, and field devices (refer to the drawings for locations). The Panel will communicate with the control panels via the County's LAN and/or hardwire connections.
   3. Activation of the IDS shall notify the local Police Department.

C. Intrusion Detection System
   1. Provide an IDS control panel with integrated digital communicator with connections to the LAN and to a dedicated outside phone line for remote monitoring by contracted central monitoring station.
   2. Provide 12 VDC power supplies dedicated to IDS to power control panels, glass break sensors, and keypads. Provide battery backup associated with the power supplies system to keep the IDS operating for a minimum of 12 hours in the event of a utility power failure or emergency. Provide connection between power supplies and ACAMS to monitor power supply status and battery status. Program as unsupervised inputs for this purpose.
   3. Provide zone expansion input modules to the IDS panels as necessary to support the field devices shown on the drawings.
   4. Provide keypads to allow security and authorized staff arming and disarming of the IDS. Refer to drawings for quantity and locations. Keypad name brand shall match that of the control panel.
   5. Program duress alarm inputs as 24-hour alarm zone. Also refer to section 28 13 00 for duress button requirements.
   6. Interface with ACAMS
      a. Connect designated ACAMS alarm event outputs to the IDS control panel inputs (hardware or software interface allowed).

b. Provide expansion input modules to the IDS panels as necessary to support input from the ACAMS or provide software interface with the ACAMS.

7. Confirm which Central Alarm Monitoring Station (CAMS) the Owner wants to monitor the IDS prior to procuring any equipment. Confirm that CAMS supports DMP solution prior to ordering any equipment.

D. Tamper Monitoring
1. Provide tamper switches within each IDS control panel enclosure, IDS power supply enclosure, and associated wireway. Connect tamper switches to IDS control panel as monitor input points. Program these input as unsupervised inputs for this purpose. Coordinate this work with section 281300 (as this section also requires tamper switches location within control panels, power supplies, and wireway).

E. Extra Materials
1. Furnish 10% spare parts of total installed the following (round up to the next complete device)
   a. Glass break sensors
   b. Door contacts
   c. Duress button
2. Fuses: 5 of each type of fuse

1.04 SUBMITTALS

A. Product Data: Submit product information for the intrusion detection systems, including:
1. Controller
2. Digital communicator
3. Zone Expander
4. Power supplies, with power supply sizing calculations
5. Door contacts
6. Duress alarms
7. Motion detectors
8. Cellular backup

B. Shop Drawings: Submit shop drawings containing the following:
1. Device placement on floor plans
2. Block and riser diagrams
3. Custom mounting details

PART 2 - PRODUCTS

2.01 IDS CONTROL PANEL

A. IDS control panel and associated components, when assembled, shall be UL listed for Central Station, Local, Police Station Connect, Holdup, Bank Safe and Vault,

Mercantile Safe and Vault, Household Burglar Alarm and Encrypted line Security when communicating via a network.

B. Description / Features:
   1. Zones: up to75 individually addressable alarm zones and 8 programmable areas/partitions
   2. 8, minimum, on-board supervised inputs
   3. Programmable and supervised relay outputs
   4. Capacity for expansion and relay output modules
   5. Dialout:
      a. multiple telephone numbers storage/programmability
      b. primary and duplicate dialouts (for main and alternate destinations)
      c. capable of utilizing a dual phone line switcher to monitor 2 phone lines
      d. phone line monitor (loop or ground start)
   6. Ethernet/TCP/IP connectivity capable integrated digital communicator
   7. Reporting: capable of automatically issuing test and status reports
   8. Support RS-232 connectivity to third party devices for automation
   9. Enclosure: UL listed, lockable

C. Manufacturer, or equal:
   1. DMP "XR550" Series
      a. #XR550 control panel, 10 on-board zones (expandable to 574)
      b. #712-8; hardwire zone expander for XR550 control panel, 8 zones
      c. #714-16; hardwire zone expander for XR550 control panel, 16 zones
      d. #860; relay output module
      e. #716; output expander
      f. #505-12/LX 5Amps @ 12 VDC
      g. DMP Intrusion Management software license

2.02 WIRELESS COMMUNICATOR

A. Wireless communicator shall operate on 3G/4G networks as a back-up communications channel if the wired phone port cannot function properly.

B. Wireless communicator shall meet the requirements for UL Commercial Fire, as well as UL Listed for Residential Burglary and Fire applications.

C. Wireless communicator shall meet applicable FCC requirements.

D. Enclosure:
   1. Metal
   2. Key-locking

E. Manufacturer, or equal:
   1. TelGuard (by Telular) #TG-7; backup cellular alarm communicator
   2. TelGuard (by Telular) #TG-4; GSM (3G/4G) digital wireless communicator
   3. TelGuard (by Telular) #TG-MC; Bosch interface module

2.03 SLOTTED WIRING DUCT

A. Refer to section 28 00 00 for slotted wiring duct product requirements.

2.04 WIREWAYS

A. Refer to section 28 00 00 for wireway product requirements.

2.05 POWER SUPPLIES

A. Refer to section 28 13 00 for power supply product requirements.

2.06 BATTERIES

A. Refer to section 28 13 00 for battery product requirements.

2.07 KEYPAD

A. Keypads shall the control panel.

B. Keypads shall come equipped with the following:
   1. LCD, 2 text lines (minimum), 16-character per line (minimum)
   2. Back lighted multi-key touch pad
   3. Keys light on entry or key press
   4. Audible annunciator (e.g., piezo buzzer) for audible feedback
   5. User-controlled/adjustable brightness and loudness

C. Keypads shall provide the ability to display for each detection point the following:
   1. Alarm
   2. Trouble
   3. Supervisory
   4. Faulted
   5. Custom text

D. Keypads shall display system-wide events, including:
   1. Local system test
   2. Sensor reset
   3. Event log

E. Manufacturer, or equal:
   1. DMP #7060 Thinline LCD Keypad
   2. DSC #LCD4501T; programmable keypad, for MAXSYS control panel

2.08 GLASSBREAK DETECTORS

A. Type: Digital, utilizing DSP technology

B. Mounting: Surface or flush mount either vertically or horizontally within 25' of protected glass surface

C. Operating Voltage: 12 VDC

D. Manufacturer, or equal:
   1. C&K Systems
      a. #FG-1025; "IntelliSense" wall-mount sensor
      b. #FG-1025Z; "IntelliSense" ceiling-mount sensor
   2. DSC
      a. #AC-100; glassbreak detector, wall mount, Form 'A' alarm contact
      b. #AC-101; glassbreak detector, wall mount, Form 'A' alarm contact, and tamper switch
      c. #AC-102; glassbreak detector, wall mount, Form 'C' alarm contact, and tamper switch
      d. #AC-500; glassbreak detector, ceiling mount, Form 'A' alarm contact, and tamper switch
   3. Interlogix
      a. ShatterPro; wall-mount sensor

2.09 MAGNETIC CONTACT SWITCHES

A. Refer to section 28 13 00 for magnetic contact switch product requirements.

2.10 DURESS BUTTON

A. Refer to section 28 13 00 for product requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General
   1. Install equipment per manufacturer's instructions.
   2. Install devices, stations, etc., square and plumb. Set flush-mounted units so that the face of the cover, bezel, or escutcheon matches the surrounding finished surface.
   3. Install so that there are no gaps, cracks, or obvious lines between the trim and the adjacent finished surface.
   4. Install to heights shown on drawings. Heights shall comply with applicable ADA requirements.
   5. Provide supervisory and end of line resistors as required.
   6. At control panels, place and route wiring within wireway and enclosures; do not leave wiring exposed. Within enclosures, route wiring within wire management apparatus, such as slotted wiring duct.

B. IDS Control Panel and Power Supply
   1. Install IDS enclosure on wall within the ACAMS enclosures and wireway infrastructure.
   2. Install control panel and associated expansion boards within IDS enclosure. Include standoff brackets and other accessories to mount control boards to perforated panel within enclosure.
   3. Connect IDS control panel, expansion modules, etc., to associated power supply. Do not power IDS control panels via plug-in transformers.
   4. Install power supply and associated hardware adjacent to the IDS panel.
   5. Coordinate connection of phone jacks in IDS control panel (for communications to the contracted central station) to designated phone lines.

C. Wireless Back-Up:
   1. Locate antenna (or antennas) as determined by site cell coverage conditions.

D. Keypad:
   1. Mount key pad on cover of alarm panel for ease of programming and viewing device status.

E. Glass Break Sensors
   1. Prior to installation, verify locations of glass break detectors shown on drawings. Adjust final locations to maximize coverage and optimize detection.
   2. Install glass break detectors so that detection pattern is not obstructed by objects.

3.02 PROGRAMMING

A. Prior to the completion of construction, schedule a meeting with the County to determine the programming criteria. Document the results of the meeting and perform necessary programming to achieve the County's requests. During the meeting, discuss the following:
   1. Alarm priority levels
   2. Zone or alarm point descriptions
   3. User authority levels to arm/disarm areas or alarm partitions
   4. Alarm notification requirements
   5. Action/responses from individual input points
   6. Defining alarm messages and standard response messages applicable to site
   7. Interface requirement with ACAMS and VSS
   8. Central station requirements, response from individual alarm points, password, and call list information
   9. Auto arm/disarm schedules
   10. Schedules and time codes
   11. Holidays and holiday types (priorities)
   12. Standard and custom (expanded) reports
   13. System database backup procedures

B. Program and setup the system such that no additional programming other than entering new access codes is required.

C. Use the point names provided on the system point schedule.

3.03 EXTRA MATERIALS

A. Furnish extra materials to County. Produce a transmittal with an itemized list including quantities, recipient, and receipt date. Submit copy of County-signed transmittal with project closeout documents.

B. Place fuses inside each equipment/panel and power supply enclosure.

C. Turn over keys (equipment enclosures, low voltage power supplies, security junction boxes, rack cabinets, etc.) to the County. Produce a transmittal with an itemized list of keys, recipient, and receipt date. Submit copy of County-signed transmittal with project closeout documents.

3.04 TRAINING

A. Combine training on the IDS with training on the ACAMS (refer to section 28 13 00). Provide 2 hours of training to the County, including hands-on use of the keypads, programming the system, and other key aspects of functionality.

3.05 TESTING

A. Perform acceptance testing to the intrusion detection system in accordance with Section 28 08 00.

END OF SECTION 28 16 00

SECTION 28 23 00

VIDEO SURVEILLANCE SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Video Surveillance System (complete system)
2. Video Management System (software)
3. Network Video Recorder and Storage (hardware)
4. Fixed cameras, lenses, mounts, and housings
5. Panoramic cameras, lenses, mounts, and housings
6. Power Supplies

B. Products Furnished But Not Installed Under This Section:
1. None

C. Products Installed But Not Furnished Under This Section:
1. None

D. Products Specified But Not Installed Under This Section:
1. None

E. Products Furnished and Installed Under Another Section:
1. 120VAC power
2. Telecommunication cabling between telecom room and cameras; refer to Section 271513.
3. Network switches, with Power over Ethernet (PoE)

F. Related Sections:
1. Consult other Divisions, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.
2. Section 27 15 13, “Communications Horizontal Cabling”
3. Section 27 13 23, “Communications Backbone Fiber Optic Cabling”
4. Section 28 00 00, “Basic Security Requirements”
5. Section 28 08 00, “Security System Acceptance Testing”
6. Section 28 05 13, “Security System Cabling”
7. Section 28 05 53, “Security System Labeling”
8. Section 28 13 00, “Access Control and Alarm Monitoring System”
9. Section 28 16 00, “Security Intrusion Detection System”
10. Section 28 26 00, “Security Communication System”

1.02 REFERENCES

A. Comply with the References requirements of Section 28 00 00.

B. In addition to the codes and standards listed in Section 28 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
   1. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
      a. UL 497, "Protectors for Paired-Conductor Communication Circuits"

1.03 DEFINITIONS

A. Definitions as described in Section 28 00 00 shall apply to this Section.

B. In addition to those definitions in Section 28 00 00, the following list of terms as used in this specification defined as follows:
   1. "A" and "AMP": amperes
   2. "ACAMS": access control and alarm monitoring
   3. "CCD": charge-coupled device
   4. "CMOS": complementary metal oxide semiconductor
   5. "DSP": digital signal processing
   6. "FC": foot candles
   7. "FPS": frames per second
   8. "IDS": intrusion detection system
   9. "KVM": keyboard, video, mouse switch
   10. "NAS": network-attached storage
   11. "NVR": network video recorder
   12. "PoE": Power over Ethernet
   13. "PTZ": pan-tilt-zoom
   14. "RAID": redundant array of independent disks
   15. "SAN": storage area network
   16. "VAC": volts alternating current
   17. "VDC": volts direct current
   18. "VMS": video management system
   19. "VSS": video surveillance system

1.04 SYSTEM DESCRIPTION

A. General: Provide engineering, labor, materials, apparatus, tools, equipment, transportation, temporary construction, and special or occasional services as required to make a complete working video surveillance system, as described in this specification.

B. Video Surveillance System (VSS) Overview
   1. The VSS is an building wide system generally comprised of fixed and Panoramic cameras (with associated mounting apparatus, housings, cabling, etc.), video

management system (software), and network video recorder and storage (hardware), that provides live video feeds for real-time surveillance and monitoring, recorded video for forensic analysis.

2. The VSS serves as the video component of the facility's overall security and safety program. Camera deployment and their respective field-of-views are strategically determined to coincide with points of security and access control as well as surveillance of open and high-security spaces.
3. The VSS interconnects and integrates with the ACAMS and security communications system such that alarms/events generated within the other systems (generally carried through the ACAMS) cause VSS and the VMS to behave in a programmed manner.
   a. Program active icons in graphic user interface map in the ACAMS to allow camera call up based on the selection of icon.
4. Provide a fixed dome camera on the exterior of the elevator penthouse as indicated on the project drawings. Camera to provide cityscape view. Do not integrate with the VMS software. Connect camera to the computer network and provide IP address to the AV contractor for integration to systems in their scope.

C. Video Surveillance System (VSS) Scope
1. Server (to host VMS software): Provide one server to host VMS software package.
2. Video Storage hardware / Network Video Recorder (NVR): Provide one server to store recorded video.
3. KVM Switch: Provide a rack-mounted sliding drawer type combination KVM/switch unit in a cabinet – located directed by the County (default will be the same cabinet as the VMS server at approximately 45"-48"). Connect the KVM switch to the VMS server and NVR server.
4. Video Management System Software: Provide VMS software package, including loading the VMS package onto the VMS server and integrating the software onto the network and integrating the video storage hardware into the VMS. Coordinate with the County's IT department for network integration and other IP-related requirements. Provide VMS licenses in a quantity sufficient to support the project's cameras and client workstations plus 20% (minimum, round up to nearest whole number).
5. Program the software system to meet the project requirements including programming recording input points, video call up, and other aspects of the system. Provide software interface to the ACAMS, IDS, and security communications system for alarm call up of cameras on predefined alarm events.
6. VMS Client Software: Provide (load and configure) VMS client software onto designated Owner workstation(s) for monitoring and viewing capabilities.
7. Program the VMS system for call-up and alarm monitoring of camera views on designated Owner workstations.
8. Provide cameras as shown on the drawings. Provide outdoor housing and mounts for exterior cameras.
9. Provide power supplies to supply power to cameras. Do not combine with ACAMS power supplies.

D. Surge Protection: Regardless of who provides the cabling to outdoor cameras, ensure that the connection infrastructure for outdoor cameras receive proper protection against transient voltages. Installations shall comply with NEC 800.47, NEC 800.50 and NEC 800.90.

E. Extra Materials
1. Furnish 10% spare parts of total installed the following (round up to the next complete device):
   a. Fixed cameras
   b. Panoramic cameras
   c. Power Supplies (specifically for VSS)
   d. Relays

1.05 SUBMITTALS

A. Contractor Qualifications: Submit certifications for the manufacturers of the video surveillance equipment.

B. Product Data: Submit product information for components specified herein.

C. Shop Drawings:
1. Device placement on floor plans.
2. Point-to-Point Diagrams: Include wiring, points of connection and interconnecting devices between the following:
   a. Video surveillance system, monitors, and recording equipment
   b. Network Switches
   c. Devices connected to the system
   d. Miscellaneous control relays
   e. Conductors (identify conductors on the point-to-point diagrams with the same tag as the installed conductor)
3. Camera Matrix: Submit as an Excel-compatible spreadsheet a matrix that includes each camera. The matrix, using the same ID as shown on the as-built drawings, shall include the following column headers, at a minimum:
   a. Device
   b. Device Identifier
   c. Location
   d. MAC Address
   e. IP Address
   f. IDF Room
   g. Network Switch
   h. Switch Port
4. Block Diagram/Riser Diagram: Show the video surveillance system components, conduit, wire types, and sizes between them, including cabling interties between termination hardware.
5. User interface graphics with icons and control buttons displayed.
6. Custom mounting details

D. Submittal Requirements at Closeout:
1. As-Built Drawings (combined with the ACAMS as-built drawings): submit as-built drawings that includes block diagram, riser diagram, wiring diagram, and floor plans and site plans showing camera locations (tagged with a unique ID per camera).
2. Camera Matrix: submit as an Excel-compatible spreadsheet a matrix that includes each camera. The matrix, using the same ID as shown on the as-built drawings, shall include the following column headers, at a minimum:
   a. Camera Type
   b. Camera ID (shall match the as-built plans)
   c. Camera manufacturer and model (shall match the approved product data submittal)
   d. Camera lens manufacturer and model (shall match the approved product data submittal)
   e. Location
   f. MAC Address
   g. IP Address
   h. IDF Room
   i. Network Switch
   j. Switch Port
   k. Maintenance requirements
3. O&M Manuals: submit O&M Manual as a binder or soft copy (bookmarked PDF) including the following, at a minimum:
   a. Product data – approved submittals (‘cleaned up’) and electronic
   b. As-built drawings, printed to 11x17 / tabloid landscape and electronic PDF files and native files (DWG or RVT) on storage media
   c. Warranty statement and service protocol (guidelines, contact numbers, etc.)
   d. Maintenance requirements
   e. Station Matrix, printed to 11x17 / tabloid landscape and electronic PDF files and native XLSX file on storage media
   f. Network switches and ports configuration information

1.06 WARRANTY

A. Warrant the system for a period of one year from the date of system acceptance. The warranty shall cover system operation/performance, parts, and labor. Correct deficiencies within 24 hours of notification.

PART 2 - PRODUCTS

2.01 NETWORK VIDEO RECORDER

A. Features
1. Complete network video platform that encompasses video recording, video viewing, reviewing recorded video, and storing video for indefinite periods of time.

2. Full control of camera selections, sequencing, and viewing modes
3. The system simultaneously records, displays live video, and plays back video. None of the video operations interfere with each other. Live view and video playback does not interrupt the recording process.
4. Recorders capture, digitize, and store video. Recorders may record full-time, in response to an alarm, or based on a user-defined schedule. Full-time recording refers to 24 hours per day, 7 days per week, 365 days per year.
5. Network: Internal network interface for connection to a 10/100BaseT LAN using TCP/IP network protocol
6. Web Access: Web-based remote access via browser

B. Recorders
1. Video Information
   a. Store for each clip video source, capture date, start time, and stop time. Source identified as either a monitor or a camera. Information to be available during playback
   b. Store alarm information in the database on the main server when the video is in response to an alarm condition.
2. Video Storage
   a. Video stored in clips on the recorder's internal hard drive. As the hard drive becomes full, groom oldest clips to make room for new video.
   b. Ability to utilize a variety of network storage devices such as external disk arrays, RAID and NAS/SAN devices, and external disk drives for exporting, backup, or sharing images.
3. Video Authentication
   a. Fingerprint each video clip through a mathematical algorithm during the video capture process. The fingerprint becomes part of the clip and used by the playback software to verify the video has not been altered.
4. Alarm Recording
   a. Recording Options
      1) Alarm condition via activation of an external alarm contact.
      2) Internal video motion detection
   b. Recording programmable by camera and by time and date schedule.
   c. Allow a mix and match of continuous recording and alarm recording, based on camera input and capture card connection.
   d. Pre and post alarm recording
5. Video Motion Detection
   a. Each video input capable of detecting activity from camera input and to initiate an alarm condition.
   b. Video motion detection areas operator selectable for each camera input. If the scene changes within the alarm area, an alarm condition is initiated.
6. Viewing of both live and archived images, from multiple remote systems.
7. Remote event notification
8. Password protected via user authorization, with profiles assigned by the system administrator, and database tracking of evens.

C. Manufacturer, or equal:
1. BCD Video
2. DNF Security
3. Dell

D. Video Management System Software
1. Salient – Complete view VMS
2. Provide sufficient camera licenses to support all cameras shown on project drawing plus 20% spare.
3. Provide integration software and licenses for AMAG integration

2.02 KVM SWITCH

A. Features
1. Integrated 1x8 KVM switch
2. 17" LCD monitor, 1280x1024 resolution minimum
3. Trackball or touchpad mouse
4. Rack mount chassis in a 1U sliding tray
5. Provide cables required for connection to ACAMS and other rack mountable security devices.

B. Manufacturer, or equal:
1. Dell PowerEdge #180AS KVM with Dell #XT912 LCD monitor, keyboard, and touchpad
2. Belkin #F1DC108H 19-inch 1RU Sliding Widescreen Rack Console

2.03 CAMERAS

A. Fixed IP Interior Dome Camera
1. Type: Color, vandal-resistant
2. Power: PoE
3. Imager: 1/3 inch format, unless otherwise noted
4. Lens Mount: Accept a "CS" mount auto or manual-iris lens
5. Resolution: 1080p HD
6. Minimum Light Level: 0.1 fc imager illumination at full video, unless otherwise noted
7. Lens: 3 to 9mm, unless otherwise noted
8. Frame Rate: 30fps at H.264
9. Manufacturer, or equal:
    a. Axis #P3367 -V IP dome megapixel camera
    b. Sony
10. Accessories, or equal:
    a. Axis ceiling mount kit
    b. Axis mounting plate
    c. Sony

B. Fixed IP Exterior Dome Camera
1. Type: Color, vandal-resistant
2. Power: PoE
3. Imager: 1/3 inch format, unless otherwise noted
4. Lens Mount: Accept a “CS” mount auto or manual-iris lens
5. Resolution: 1080p HD
6. Minimum Light Level: 0.1 fc imager illumination at full video, unless otherwise noted
7. Lens: 3 to 9 mm, unless otherwise noted
8. Frame Rate: 30fps at H.264
9. Manufacturer, or equal:
    a. Axis #M3025-VE vandal-resistant fixed dome with remote focus and zoom for outdoor use
    b. Sony
10. Accessories, or equal:
    a. Axis wall bracket
    b. Sony

C. Elevator Analog Camera
1. Type: Color, solid-state CCD with DSP technology, unless otherwise noted
2. Power: 24 VAC, 60Hz
3. Imager: 1/3 inch format, unless otherwise noted
4. Lens Mount: Accept a "CS" mount auto or manual-iris lens
5. Lens: Field determine, unless otherwise noted
6. Resolution: 460 TVL minimum resolution (EIA RS-170), unless otherwise noted
7. Minimum Light Level: 0.1 fc imager illumination at full video, unless otherwise noted
8. Manufacturer, or equal:
    a. Pelco #IS20/21 series camera with dome housing

D. 360-Degree Camera
1. Video Compression format: H.264, MPEG-4, MJPEG
2. Power over Ethernet (IEEE 802.3af, Class 3)
3. Resolution: 10240 x 1920 – 8 Megapixel
4. Frame Rate: 12.5 ips at H.264
5. Sensor: Four 1/2-1/2” progressive scan CMOS sensors
6. Vandal Resistant Dome
7. Type: Day/Night
8. Manufacturer, or equal:
    a. Axis P3707-PE
9. Accessories, or equal:
    a. Axis T94M02D Pendant kit
    b. Axis T91D61 wall mount and corner bracket

2.04 VIDEO ENCODER

A. General
1. Video Compression: H.264
2. Resolution: minimum 4CIF
3. Frame Rate: Up to 30/25 per channel
4. Alarm and event management
5. Channels: 1 minimum

B. Video Encoder
1. Security: IP address filtering and HTTPS encryption
2. PoE power
3. Manufacturer, or equal:
   a. Axis #M70011

2.05 LINE PROTECTORS

A. For use on data cables serving exterior cameras.

B. Manufacturer, or equal:
1. Transtector #1101-994
2. DITEK

2.06 POWER SUPPLIES/BATTERY CHARGERS

A. Input: 120 VAC; Output: 24 VAC, continuous current

B. Fully supervised

C. Manufacturer, or equal:
1. Pelco MCS16-20 UL Listed Power Supply Camera 20Amp 16 Output
2. Altronix R2416300ULCB 16 PTC Outputs CCTV AC Rack Mount Power Supply 24VAC @ 12.5A or 28VAC @ 10A Class 2 Rated

PART 3 - EXECUTION

3.01 PRE-CONSTRUCTION PLANNING

A. Prior to the completion of construction, schedule a meeting with the County and the Engineer to determine the system programming requirements, such as the following:
1. Camera naming/numbering
2. Field of view per camera
3. Settings for contrast, wide dynamic range, and auto-iris
4. Camera call-up and recording features, including video motion detection

B. Camera Locations
1. Prior to installation, coordinate/confirm camera locations. As needed, perform a field walk with the County. Obtain County signoff of camera locations and field of view per camera prior to installation.
2. Prior to rough-in construction, coordinate rough-in locations and requirements per camera.

3.02 INSTALLATION

A. Network Video Recorder
1. Rack mount VSS equipment located in the TBD.

B. Cameras
1. Field determine exact placement of cameras to ensure complete coverage.
2. Field determine fixed camera lens size to ensure complete coverage.
3. For exterior cameras, provide liquidtight flexible metallic conduit from junction box to camera housing and connect from below.
4. Paint exterior housing to match adjacent surfaces
5. Penthouse exterior camera: coordinate with Owner and audiovisual contractor to orient and configure.

3.03 PROGRAMMING

A. Network Video Recorder
1. Connect the servers/storage to the County's LAN/WAN to allow remote viewing from authorized workstations utilizing the VMS client viewing software. Configure the cameras and servers at the following initial requirements:
   a. Codec: H.264
   b. Resolution: 1080p
   c. Storage: 30 Days (minimum)
   d. Recording: Continuous
   e. Frame Rate: maximum frame rate for camera

B. Document the results of the meeting and perform necessary programming to achieve the County's requests.

C. Setup and program the system such that no additional programming required.

D. Use the camera naming convention agreed upon at in the programming meeting when programming point names into the system.

E. Perform two full system back-ups at completion of initial programming and deliver one copy to the County with a letter of transmittal explaining information included in back-up and brief description of recovery procedures. Perform back-ups on a regular basis through the remainder of the project.

3.04 TESTING

A. Test the video surveillance system in accordance with Section 28 08 00.

3.05 SYSTEM OPERATION CONFIRMATION

A. At 30 days after substantial completion, perform field review of video surveillance system software with the County to "fine tune" configuration settings for resolutions, recording, and frame rate to meet the storage and operational requirements.

END OF SECTION 28 23 00

SECTION 28 26 00

SECURITY COMMUNICATIONS SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Security Communications System, including the following:
1. Intercommunications system (e.g., entry telephones)
2. Interface to ACAMS and to VSS

B. Products Furnished but not Installed under this Section:
1. None

C. Products Installed but not Furnished under this Section:
1. None

D. Products Specified but not Installed under this Section:
1. None

E. Products Furnished and Installed under another Section:
1. 120 VAC power service
2. Telecommunication cabling connectivity between VoIP system-connected, PBX-connected, and POTS line-connected call stations and telecom rooms. Refer to section 271513.
3. Telecommunications circuits from the public switched telephone network (PSTN) – "POTS" line.

F. Related Sections:
1. Consult other Divisions, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.
2. Section 27 15 13, "Communications Horizontal Cabling"
3. Section 28 00 00, "Basic Security Requirements"
4. Section 28 05 13, "Security System Cabling"
5. Section 28 05 53, "Security System Labeling"
6. Section 28 08 00, "Security System Acceptance Testing"
7. Section 28 13 00, "Access Control and Alarm Monitoring System"

1.02 REFERENCES

A. Comply with the References requirements of Section 28 00 00.

B. In addition to the codes and standards listed in Section 28 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
   1. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
      a. UL 497, "Protectors for Paired-Conductor Communication Circuits"
      b. UL 60950-1, "Information Technology Equipment - Safety"
      c. UL 2017, "General-Purpose Signaling Devices and Systems"
   2. Code of Federal Regulations (CFR) Title 47 "Telecommunication", Chapter I "Federal Communications Commission (FCC)":
      a. Part 68, "Connection of Terminal Equipment to the Telephone Network"

1.03 DEFINITIONS

A. Definitions as described in Section 28 00 00 shall apply to this section.

B. In addition to those Definitions of Section 28 00 00, the following list of terms as used in this specification defined as follows:
   1. "A" and "AMP": amperes.
   2. "ACAMS": access control and alarm monitoring.
   3. "PBX" private branch exchange.
   4. "POTS" plain ol' telephone service.
   5. "SCS": security communications system.
   6. "VAC": volts alternating current.
   7. "VDC": volts direct current.
   8. "VSS": video surveillance system.
   9. "VoIP": voice over internet protocol.

1.04 SYSTEM DESCRIPTION

A. General:
   1. Provide engineering, labor, materials, apparatus, tools, equipment, transportation, temporary construction, and special or occasional services as required to make a complete working security communications system installation as described in these specifications. Provide boxes, fittings, covers, power supplies, amplifiers/repeaters, terminal cabinets, and other material required for a complete system, whether expressly stated or not.
   2. Provide equipment from a single manufacturer for the headend equipment, command stations, and substations/call stations.

B. Security Communications
   1. The security communications system (herein "System") is a communications system including ring down entry telephone unit at controlled access entries. The system's communications shall be two-way full duplex and hands-free (after pressing the activation button).

2. The System shall consist of entry telephone and interties to other systems. Refer to the drawings for station locations.
3. Entry telephone stations shall utilize the County's PBX system and POTS lines dial-up connection.
4. Station Activation Signaling: Where a surveillance camera covers an entry telephone station, connect the station's relay output to an ACAMS input. Program (or coordinate to have programmed) the ACAMS to, upon activation of a substation, signal the VSS to call up the associated camera onto the primary monitor and to record (if not already recording).
5. Label each entry telephone station with a unique identifier (ID). This ID shall match the as-built drawings.

C. Surge Protection: It is the responsibility of the security communications systems contractor, regardless of who provides the cabling, to ensure that outdoor stations receive proper protection. Installations shall comply with NEC 800.47, NEC 800.50, and NEC 800.90.

1.05 SUBMITTALS

A. Product Data: Submit product information, including the following:
1. Entry telephone stations and related equipment
2. Wiring, cabling, and termination apparatus

B. Shop Drawings: Submit shop drawings containing the following:
1. Plans: show device placement on floor plans
2. Block Diagram / Riser Diagram: show system components, conduit, wire types, termination hardware, and interties to other systems.
3. Point-to-Point Wiring Diagrams: show stations, equipment, wiring types, wiring connection points, control relays, connection/intertie to other systems (e.g., ACAMS)
4. Details: show custom plates or special mounting

C. Samples: Submit samples of the following devices:
1. Entry telephone stations
2. Labels

D. Submittal Requirements at Closeout:
1. As-Built Drawings (this may be combined with the ACAMS as-built drawings): submit as-built drawings that includes block diagram, riser diagram, wiring diagram, and floor plans showing station locations (tagged with a unique ID per station), command station locations, and other equipment locations.
2. Station Matrix: submit as an Excel-compatible spreadsheet a matrix that includes each station. The matrix, using the same station ID as shown on the as-built drawings, shall include the following column headers, at a minimum:
   a. Station ID (shall match the as-built plans)
   b. Station type – telephone

c. Station manufacturer and model (shall match the approved product data submittal)
d. Connection to ACAMS – Yes/No; if yes, input the point ID
e. POTS Line – if the station is connected directly to a POTS line (e.g., entry telephone station connected directly to outside lines) , including the number
f. Maintenance requirements (such as battery replacement)

3. O & M Manuals: submit O&M Manual as a binder including the following, at a minimum:
   a. Product data – approved submittals ('cleaned up') and electronic
   b. As-built drawings, printed to 17x11 / tabloid landscape and electronic PDF files and native files (DWG or RVT) on storage media
   c. Warranty statement and service protocol (guidelines, contact numbers, etc.)
   d. Maintenance requirements
   e. Station Matrix, printed to 17x11 / tabloid landscape and electronic PDF files and native XLSX file on storage media

1.06 WARRANTY

A. Warrant the system for a period of 1 year from the date of written system acceptance. The warranty shall cover system operation/performance, software, parts, and labor. Correct deficiencies within 24 hours of notification.

PART 2 - PRODUCTS

2.01 ENTRY TELEPHONE SYSTEM

A. General: Provide fittings, covers, power supplies, terminal cabinets, and other material required for a complete two-way voice entry telephone system. Provide equipment from a single manufacturer.

B. PBX Attached Stations
   1. Programmable from touch tone phones
   2. Programmable to dial a second number on a busy signal or ring no answer
   3. Hands free operation
   4. Phone line powered
   5. Touch tone or pulse dialing
   6. Dry relay contact

C. Manufacturer:
   1. Viking# E-30-EWP and #LDB-2 loop detector
   2. Or Equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Follow installation guidelines set forth in Section 28 00 00 Basic Security Requirements.

B. For stations located outdoors protection

C. Stations:
1. Install square and plumb. Install so that there are no gaps, cracks or obvious lines between the rough-in/trim and the adjacent finished surface.
2. Set flush mounted units with the face of the cover, bezel or escutcheon in the same plane as the surrounding finished surface.
3. Ready the substations to receive final finish, as applicable. Protect in place.
4. For outdoor installation, drill weep holes into bottom of substation's backbox.
5. Install substation and final connections.

3.02 PROGRAMMING

A. Prior to the completion of construction, schedule a meeting with the County and Engineer to determine of the programming criteria. Discuss the following issues:
1. Call routing definitions for each station
2. Phone numbers for roll-over
3. Backup Phone Numbers
4. Camera call-up and recording requirements upon activation

B. Program the entry telephone system as required based on the results of the meeting.

3.03 TESTING

A. Test the entry telephone system in accordance with Section 28 08 00.

END OF SECTION 28 26 00

SECTION 28 31 00

FIRE DETECTION AND ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This project provides a new fire alarm system installation for the building. The building will utilize an addressable fire alarm control unit as the building's control unit. The system design utilizes system connected smoke and/or heat detectors for protection of areas and spaces as required by the California Code of Regulations (CCR) Title 2 – California Building Code and Title 9 - California Fire Code (as amended and adopted by the City of Oakland), , manual fire alarm pull stations, fire sprinkler waterflow and valve position supervisory switches(es),combination audible visual occupant notification appliances (e.g. horn/strobes), and visual occupant notification appliances (e.g. strobes). The fire alarm control unit (FACU) shall be located in the Mezzanine (in the same location as the existing fire alarm control unit and a remote annunciator is to be located in the Building Lobby. All fire alarm initiating devices and occupant notification appliances shall be compatible with the new fire alarm control unit.

B. The existing fire alarm system utilizes an EST-2 control unit and compatible addressable modules. The Project desires to utilize the existing EST-2 addressable components to the extent practical and feasible. The preferred installation will utilize and EST-3 fire alarm control unit. Other systems may be considered provided the installation is in accordance with the Codes and Standards cited in this Specification Section.

C. The new fire alarm control unit shall interface with the roll-down door assemblies provided for protection at each elevator opening. The control unit shall cause for the operation of the door assembly upon alarm of the elevator smoke detector.

D. Firefighter 2-way communication capabilities shall be provided at each elevator lobby and shall communicate with the fire alarm control unit.

E. Devices, and appliances shall be located to be in accordance with the requirements of NFPA 72, *National Fire Alarm and Signaling Code*, 2016 Edition (area-wide detection is not provided), and the system shall be in accordance with the manufacturer’s listings and approvals and the California State Fire Marshal’s Listing.

1.2 WORK INCLUDED

A. Drawings and General Provisions of this Contract, including General and Supplementary Conditions and the other Sections, apply to work of this Section.

B. Where provisions of the referenced Codes and Standards are repeated in this Specification, it is intended only to call attention to them. It is not intended that other parts of the referenced Codes and Standards shall be assumed to be omitted if not repeated in this Specification.

C. Include all labor, material, equipment and service necessary for, and reasonably incidental to the design, fabrication, and installation of the complete fire alarm system for the building. The system installation includes those items identified above (e.g. addressable fire alarm control unit, system connected smoke and/or heat detectors, manual fire alarm pull stations, waterflow and valve position supervisory switches, combination audible visual occupant notification appliances, visual occupant notification appliances, audible notification appliances, and the necessary and appropriate ancillary equipment incidental to the system operation.

D. It is the intent of these specifications to describe the complete fire alarm system. The Contractor is responsible for carefully and critically reviewing the Contract Drawings, specifications, and site conditions to the extent practicable. Any error, omission, discrepancy or lack of clarity shall be promptly identified to the County's Representative for clarification.

E. In general, work shall include, but not be limited to:
   1. Provide and install fire alarm system for the protection of the areas required by the referenced Codes and Standards.
   2. Provide all equipment necessary for initiating devices and display.
   3. Provide all design, calculations, details and software required to install the fire alarm system.
   4. Provide all penetrations through walls, floors and ceilings necessary for the installation of the fire alarm system. Provide fire stopping as required.
   5. Perform systems and device testing.
   6. Perform training and provide the Manufacturer's Certification for the facility operations personnel.

1.3 RELATED SECTIONS

A. Basic Electrical Requirements

B. Conduit

C. Wire and Cable

D. Section 21 13 00 - Fire Suppression Sprinkler Systems

1.4 REFERENCED PUBLICATIONS

A. System, equipment, installation, and materials and methods used shall comply with applicable provisions of the following standards:
   1. National Fire Protection Association (NFPA) 72 - National Fire Alarm Code

2. California Code of Regulations, Title 24, Parts 2 and 9, California Building and Fire Codes, respectively, as amended and adopted by the City of Oakland.
3. California Code of Regulations, Title 24, Part 3, California Electrical Code
4. Underwriters Laboratories Fire Protection Equipment List
5. California State Fire Marshal's Building Equipment List

1.5 SUBMITTALS

A. Provide all submittals as identified in the General Conditions.

B. Product submittals shall provide the following information:
   1. Manufacturer's catalog data, to include material description, agency approvals, operating characteristics, electrical characteristics, dimensions, mounting requirements and accessories.
   2. Product data sheets for system components shall be highlighted to indicate the specific products, features, or functions required to meet this specification.
   3. Alternate or as-equal products submitted under this contract shall provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this specification.
   4. Manufacturer's product installation sheets shall include a copy of the documentation that it is UL Listed and listed in the California State Fire Marshal's Building Equipment List.

C. Shop drawings shall meet the following requirements:
   1. Shop drawings shall be prepared by persons with the following qualifications:
      a. Trained and certified by the manufacturer of the submitted equipment in fire-alarm system design.
      b. NICET-certified fire-alarm technician, Level IV minimum or a California licensed Fire Protection Engineer.

D. Shop drawings shall include the following, as a minimum:
   1. Coversheet with project name, address and drawing index.
   2. General notes drawing with peripheral device backbox size information, part numbers, device mounting height information, and the names, addresses, point of contact, and telephone numbers of all contract project team members.
   3. Provide device floor plans for all areas served by the fire alarm system. Floor plans shall indicate accurate locations for all control and peripheral devices. Drawings shall be NO LESS THAN 1/8-INCH SCALE. If individual floors need to be segmented to accommodate the 1/8" scale requirements, KEY PLANS and BREAK-LINES shall be provided on the plans in an orderly and professional manner.
   4. All addressable devices shall be shown. Coordinate the device address with the same device shown on the riser diagram.
   5. Identify all notification appliances with a circuit and item number. Coordinate the circuit and item number with the same device shown on the riser diagram.

6. Show all raceways, marked for size, conductor count with type and size, showing the percentage of allowable California Electric Code fill used.
7. Areas required to meet intelligibility requirements shall be clearly identified.
8. Device riser diagram, which individually depict all control panels, annunciators, addressable devices, and notification appliances. Shall include a specific, proposed device description above each addressable device. Shall include a specific, discrete device address that corresponds to addresses shown on the floor plans. Drawings shall provide wire specifications, and wire identification for all conductors depicted on the riser diagram. All circuits shall have identifiers that shall correspond with those required on the control panel and floor plan drawings. End-of-line resistors (and values) shall be depicted.
9. Control panel drawing(s) shall show internal component placement and all internal and field terminations. Provide details indicating where conduit connections shall be made to avoid conflicts with internally mounted batteries. For each additional fire alarm panel, a separate drawing which clearly indicated the panel designation, service and location of the control enclosure.
10. Provide typical device wiring diagrams that show all system components, and the respective field wiring. Wire type, gauge, and jacket shall be indicated. When an addressable module is used in multiple configurations for monitoring or controlling equipment, provide a drawing for each application. End-of-line resistors (and values) shall be shown.
11. Provide a fire alarm system function matrix that illustrates alarm input/out events in association with initiation devices. Matrix summary shall include system supervisory and trouble output functions.
12. System Calculations as detailed elsewhere in this specification.

E. Design Calculations: Provide all necessary and required design calculations to demonstrate system operation in accordance with this Specification and the referenced Codes and Standards.
   1. Provide battery capacity calculations for each power supply that uses batteries for secondary power. Identify all loads. Identify any loads shed during alarm operation. Use the manufacturer's recommended methods and/or forms.
   2. For each 24VDC NAC, provide worst case voltage drop calculations. The load shall be treated as a lump sum at the end of the circuit. Worst case power supply terminal voltage shall include all applicable internal power supply losses. Using 85% of nominal circuit voltage (20.4VDC) shall not be accepted as lowest terminal voltage without manufacturer's published documentation stating there are no internal losses in the power supply.

F. Installation shall not begin until approval of the above items has been received from the County's Representative.

G. Prior to requesting an acceptance test of the installation, submit 3 sets of Record Drawings (corrected approved Shop Drawings) in reproducible format (Xerox vellum or approved equal).

H. Record Drawings: Corrected and approved Working Plans shall be submitted in both electronic reproducible graphic format (Xerox velum or approved equal) to the County prior to final acceptance of the installation.

I. Prior to final acceptance of the installation, submit for approval 6 sets of labeled, bound and indexed Operation and Maintenance Manuals with manufacturer's literature, and indicating complete maintenance and operating procedures on all specialty items. Each O & M Manual shall include a list of spare parts that need to be kept by the County in order to make minor repairs.

1.6 DELIVERY, STORAGE, AND HANDLING.

A. Deliver materials and store on site in original containers with seals unbroken and labels intact until time of use, in accordance with the manufacturer's instructions.

B. Carefully handle materials and equipment at all times. Use only suitable and proper equipment and appliances for the safe loading, hauling, unloading, handling, and installation of material.

1.7 DESIGN AND OPERATION

A. A new addressable fire detection and alarm system shall be installed in accordance with this Specification for the Building.

B. All equipment, devices, and appliances shall be new and shall be located to be in accordance with the spacing requirements of NFPA 72 (area-wide detection is not provided).

C. Basic Performance
   1. The control panel and all system circuit interfaces shall be modular in construction and shall include, but not be limited to the hardware, software and firmware required to perform the required functions.
   2. Signaling Line Circuits (SLC) shall be wired NFPA Style B.
   3. Notification Appliance Circuits (NAC) shall be wired Class B.

1.8 BASIC SYSTEM FUNCTIONAL OPERATION

A. When a fire alarm condition is detected and reported by one of the system initiating devices (e.g. smoke detectors, heat detector, manual pull station, or waterflow alarm), the following functions shall immediately occur:
   1. The system alarm shall operate.
   2. A local alarm signal in the control panel shall sound.
   3. The display shall indicate information associated with the fire alarm condition, including the address within the protected premises.
   4. History storage equipment shall log the information associated with each alarm condition along with the time and date of occurrence.

5. All system outputs assigned to be activated by the alarm shall be executed (e.g. alarm notification appliances) shall be activated. NOTE; Duct smoke detector alarm shall result in a supervisory signal, perform the required function (i.e. shut down HVAC fan), and not result in occupant notification appliance operation.
6. The necessary and appropriate alarm signal shall be transmitted to the remote monitoring location.

B. When a supervisory condition is detected, the following functions shall immediately occur:
1. The system supervisory shall flash.
2. A local signal in the control panel shall sound.
3. The display shall indicate information associated with the condition, including the address.
4. History storage equipment shall log the information associated with each condition along with the time and date of occurrence.
5. The necessary and appropriate supervisory signal shall be transmitted to the remote monitoring location.

C. When a trouble condition is detected, the following functions shall immediately occur:
1. The system trouble shall flash.
2. A local signal in the control panel shall sound.
3. The display shall indicate information associated with the condition, including the trouble identification.
4. History storage equipment shall log the information associated with each condition along with the time and date of occurrence.
5. The necessary and appropriate trouble signal shall be transmitted to the remote monitoring location.

1.9 QUALIFICATIONS OF THE SUPPLIER/MANUFACTURER

A. The system supplier shall have a minimum of 10 years of experience in distribution and service of the proposed equipment brand.

B. The supplier shall have successfully designed and installed similar system fire detection, evacuation voice and visual signaling control components on a previous project of comparable scope, size and complexity.

C. The supplier shall have in-house engineering and project management capability consistent with the requirements of this project. The project shall be supervised by personnel certified by NICET as fire alarm Level IV technicians.

D. The supplier shall employ qualified and manufacturer certified system designers to perform the detailed engineering design, system calculations, for all the system equipment and programming.

E. The supplier shall produce all panel and equipment drawings, submittals, and operating manuals, as detailed elsewhere in this specification.

F. The supplier shall be responsible for providing qualified on site representative(s) for coordination of system installation, and final system testing and commissioning in accordance with these specifications.

1.10 INSTALLER QUALIFICATIONS

A. A company licensed by State of California as a fire alarm installer with a C-10 contractor's license, and specializing in installing the products specified in this specification with a minimum of three years documented experience.

B. Principal installation personnel shall have completed the system manufacturer's training courses on the equipment to be installed.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished by the Contractor shall be new, first grade standard, current products of a manufacturer regularly engaged in the production of such materials and equipment. Where two or more pieces of equipment performing the same function are required, they shall be the product of one manufacturer and exact duplicates.

B. All equipment furnished by the Contractors shall be approved and/or listed by Underwriters' Laboratories or Factory Mutual, and listed in the current California Fire Marshal’s Building Equipment List.

C. All equipment and components shall be installed in strict compliance with the manufacturers' recommendations.

D. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place. Fasteners and supports shall be adequate to support the required load.

2.2 FIRE ALARM CONTROL UNIT (FACU)

A. The fire alarm control unit (FACU) shall be an addressable control panel, Edwards System Technology (EST-3), or equal.

B. The FACU shall receive signals from initiating devices including smoke and/or heat detectors, duct smoke detectors, control modules, monitor modules, manual pull stations, and fire sprinkler waterflow and valve position supervisory switches.

C. The fire alarm control panel(s) shall be a multi-processor based networked system designed specifically for fire, one-way and two-way emergency audio communications, smoke control, <extinguishing agent releasing system>, and guard patrol applications. The control panel shall be listed and approved for the application standard(s) as listed in the References section of this specification.

D. The control unit shall include all required hardware, software and site specific system programming to provide a complete and operational system. The control panel(s) shall be designed such that interactions between any applications can be configured, and modified using software provided by the manufacturer. The control panel(s) operational priority shall assure that life safety takes precedence among the activities coordinated by the control panel.

E. The operating controls shall be located in a dead-front steel enclosure behind a locked door with viewing window. All control modules shall be labeled, and all zone locations shall be identified. All panel modules shall be placement supervised for and signal a trouble if damaged or removed.

F. The fire alarm control panel shall include the following capabilities:
   1. Supervision of the system electronics, wiring, detection devices and software
   2. Up to 2500 analog/addressable input/output points
   3. Network connections with up to 63 other control panels and annunciators.
   4. Support multiple dialers (DACTs) and modems
   5. Two communication ports
   6. An internal audible signal with different patterns to distinguish between alarm, supervisory, trouble and monitor events
   7. Support multiple 24 VDC and Audio NACs
   8. User configurable switches and LED indicators to support auxiliary functions
   9. Log up to 1740 chronological events
   10. The ability to download all applications and firmware from the configuration computer at a single location on the fire network
   11. A real-time clock for time stamps and timed event control
   12. Electronic addressing of intelligent addressable devices
   13. Provide an independent hardware watchdog to supervise software and CPU operation
   14. “Dry” alarm, trouble and supervisory relay contacts
   15. Control panel modules shall plug in to a chassis assembly for ease of maintenance
   16. Field wiring shall connect to the panel using removable connectors

G. Each control panel shall include the following user oriented features:
   1. An LCD user interface control/display that shall annunciate and control system functions.
   2. Provide discreet system control switches for reset, alarm silence, panel silence, drill switch, previous message switch, next message switch and details.
   3. A “lamp test” feature shall verify operation of all visual indicators on the panel.
   4. An authorized user shall have the ability to operate or modify system functions including system time, date, passwords, holiday dates, restart the system and clear control panel event history file.
   5. An authorized user shall have the ability to disable/enable devices, zones, actions, timers and sequences.
   6. An authorized user shall have the ability to activate/restore outputs, actions, sequences, and simulate detector smoke levels.

7. An authorized user shall have the ability to enter time and date, reconfigure an external port for download programming, initiate programming and change passwords.
8. An authorized user shall have the ability to test the functions of the installed system.
9. Service groups shall facilitate one-man walk testing. Service/test groups shall be capable of being configured with any combination of addressable devices, independent of SLC wiring. It shall be possible to program alternate device responses when the device's service group is active. Devices not in an active service group shall process all events normally.
10. Provide internal system diagnostics and maintenance user interface controls to display/report the power, communication, and general status of specific panel components, detectors, and modules.
11. SLC loop controller diagnostics shall identify common alarm, trouble, ground fault, Class A fault, and map faults. Map faults include wire changes, device type changes by location, device additions/deletions and conventional open, short, and ground conditions. Ground faults on the supervised circuit wiring of remote addressable modules shall be identified by device address.
12. An authorized user shall have the ability to generate a report history for alarm, supervisory, monitor, trouble, smoke verification, watchdog, and restore activity.
13. System reports shall provide detailed description of the status of system parameters for corrective action or for preventative maintenance programs. Reports shall be displayed by the operator interface or capable of being printed on a printer.
14. An authorized user shall have the ability to display/report the condition of addressable analog detectors. Reports shall include device address, device type, percent obscuration, and maintenance indication. The maintenance indication shall provide the user with a measure of contamination of a device upon which cleaning decisions can be made.

H. The firefighter's telephone system shall provide 4-state supervised (opens, shorts, ground faults) two-way communications between remotely located phones and the main fire alarm panel. At the main fire panel, the system shall include an 8-line 160 character LCD display to show the operator the identity and location of up to 5 connected and 20 incoming calls. Each remote telephone shall be annunciated and connected independently using a dedicated addressable control module. The control unit shall provide the ability to individually select and display each two-way voice communication circuit, supporting up to five (5) remote telephones in simultaneous two-way voice "conference call" communications.
   1. Plugging a handset into a firefighter's phone jack or taking any phone off-hook shall display call-in location information in full English language up to 20 characters, without the need for individual LEDs and switches per telephone station. A distinctive audible device shall also sound at the main fire panel. The system shall also generate a ring tone in the remote phone to signify to the calling party that the main fire panel is displaying the incoming call.

2. The emergency user shall connect to a call by taking the master phone off-hook, scrolling the cursor to the desired call's ID message displayed on the LCD, and pressing the 'connect' switch, which shall silence the incoming call sounder, and complete a two-way communication path between the master phone and the remote phone.
3. To terminate a call, the operator shall scroll the LCD cursor over the connected callers' ID message, and press the 'disconnect' switch.
4. When all handsets have been unplugged and all firefighters' phones have been placed in the on-hook position, the system shall return to normal and restore all integrity monitoring functions. It shall be possible to configure any firefighter's telephone to make emergency page announcements through the one-way audio paging system, without affecting the simultaneous alarm messages to other areas in the building.
5. The firefighter's telephone system shall be an EDWARDS model 3-FTCU, or approved equal compatible with the fire alarm control unit.

I. A Windows-based Configuration Utility (CU) shall be used to create the site-specific system programming. The utility shall facilitate programming of any input point to any output point. The utility shall allow customization of fundamental system operations using initiating events to start actions, timers, sequences and logical algorithms.

J. The configuration utility shall time and date stamp all changes to the site-specific program, and shall facilitate program versioning and shall store all previous program version data. The utility shall provide a compare feature to identify the differences between different versions of the site-specific program.

K. The configuration utility shall be capable of generating reports which detail the configurations of all fire alarm panels, addressable devices and their configuration settings including generating electrical maps of the addressable device SLCs.

L. The configuration utility shall support the use of bar code readers to expedite electronic addressing and custom programming functions.

2.3 POWER SUPPLY

A. System power supply(s) shall be a high efficiency switched mode design providing multiple supervised power limited 24 VDC output circuits as required by the panel and external loads fed by the panel. Initial power supply loading shall not exceed 80% of power supply capacity in order to allow for future system expansion.

B. Each system power supply shall be individually supervised. Power supply trouble signals shall identify the specific supply and the nature of the trouble condition.

C. It shall be possible to parallel system power supplies to increase capacity or to provide redundant operation.

D. Upon failure of normal (AC) power, the affected portion(s) of the system shall automatically switch over to secondary power without losing any system functionality.

E. All system power supplies shall be capable of recharging their associated batteries, from a fully discharged condition to a capacity sufficient to allow the system to perform consistent with the requirements of this section, in 48 hours maximum.

F. All standby batteries shall be continuously monitored by the power supply. The power supply shall be able to perform an automatic load test of batteries and indicate a trouble condition if the batteries fall outside a predetermined range. Power supplies shall incorporate the ability to adjust the charge rate of batteries based on ambient temperatures. The power supply shall automatically disconnect the battery before low voltage damages the battery. Low battery and disconnection of battery power supply conditions shall immediately annunciated as battery trouble and identify the specific power supply(s) affected.

G. Batteries shall utilize sealed lead acid chemistry. Initial battery capacity shall provide 125% of calculated capacity requirements in order to allow for future system expansion.

H. All AC power connections shall be to the building's designated emergency electrical power circuit and shall meet the requirements of the California Electric Code and NFPA 72. The power circuit disconnect means shall be clearly labeled FIRE ALARM CIRCUIT CONTROL and shall have a red marking. The location of the circuit disconnect shall be labeled permanently inside the each control panel the disconnect serves.

I. The power supply shall be an Edwards 3-PPS/M series, or approved equal for the control unit utilized.

2.4 PANEL LCD AND CONTROLS

A. The system shall be designed and equipped to receive, monitor, and annunciate signals from devices and circuits installed throughout the facility.

B. Each fire alarm control panel (system node) shall be capable of supporting a backlit LCD display. The display on each system node shall be configurable to display the status of any and/or all combinations of all alarm, supervisory, trouble, monitor, or service group event messages on the network. Each LCD display on the system shall be capable of being programmed to allow control functions of any combination of nodes on the entire network. The system shall support both 168 character and 960 character LCD displays on the same network.

C. The LCD display shall provide separate alarm, trouble, supervisory, and monitor event queues of to minimize operator confusion. Receipt of alarm, trouble, and supervisory signals shall activate integral audible devices at the control panel(s) and at each remote

annunciation device. The integral audible devices shall produce a sound output upon activation of not less than 85 dBA at 10 feet.

D. The LCD display shall contain the following system status indicators:
   1. System Power Indicator
   2. System Test Indicator
   3. System CPU Fail Indicator
   4. Ground Fault Indicator
   5. Disabled Points Indicator
   6. System Normal Indicator
   7. System Common Alarm Indicator
   8. System Common Trouble Indicator
   9. System Common Supervisory Indicator
   10. System Common Monitor Event Indicator

E. The LCD display shall contain the following system switch/indicators:
   1. System Reset Switch with Indicator
   2. System Alarm Silence Switch with Indicator
   3. System Panel Silence Switch with Indicator
   4. Drill Switch with Indicator
   5. Alarm Acknowledge Switch with Indicator
   6. Trouble Acknowledge Switch with Indicator
   7. Supervisory Acknowledge Switch with Indicator
   8. Monitor Acknowledge Switch with Indicator

F. The LCD display shall contain the following system function switches
   1. System Event Message Queue Scroll Switch.
   2. Event Details Switch (provides an additional 2000 character message about the device highlighted by the operator.)
   3. Command Menu Switch
   4. 10-Digit Keypad with Enter and Backspace switches

2.5 SIGNALLING LINE CIRCUIT(S)

A. The signaling line circuit connecting panels/nodes to intelligent addressable devices including, detectors, monitor modules, control modules, isolation modules, intrusion detection modules and notification circuit modules shall be Class B.> All signaling line circuits shall be supervised and power limited.

B. When the addressable devices on a signaling line circuit cover more than one designated fire/smoke compartment, a wire-to-wire short on the circuit shall not affect the operation of the addressable devices in other fire/smoke compartments.

C. Each SLC shall support 125 addressable detector addresses and 125 module addresses. The SLC shall support 100% of all addressable devices in alarm and provide support for a 100% compliment of detector isolator bases. Initial circuit loading shall not exceed 80% in order to allow for future system expansion.

D. T-taps (branching) shall be permitted. Where possible, the devices installed at the end of each branch should be easily accessible for troubleshooting, e.g. a pull station at normal mounting height.

E. The addressable device SLC module shall be UL Listed for use with code compliant, electrically sound existing wiring.

F. Each intelligent addressable device shall transmit information about its location with respect to other devices on the circuit. This information shall be used to create an "As-Built" wiring diagram as well as provide enhanced supervision of a device's physical location. The device message and programmed system output function shall be associated with the device's location on the SLC circuit location and not a device address.

G. The SLC module shall allow replacement of "same type" devices without the need to address and reload the "location" parameters on replacement device.

H. The SLC/Panels shall notify the user when programmed devices are detected on the SLC circuit. The SLC/Panels shall notify the user when the wrong device type is installed at a location configured for a different device type on the SLC circuit.

I. Should an SLC Controller CPU fail to communicate, the SLC circuit shall go into the stand-alone mode. The circuit shall be capable of producing a loop alarm if an alarm type device becomes active during stand-alone mode to enhance system integrity.

2.6 NOTIFICATION APPLIANCE CIRCUITS

A. All notification circuits shall be supervised and power limited. Non-power limited circuits are not acceptable. All notification appliance circuits shall be Class B.

B. Initial circuit loading shall not exceed 80% in order to allow for future system expansion.

C. Notification appliance circuits shall have a minimum circuit output rating of 2 amps @ 24 VDC

D. 24VDC NACs shall be polarized and provide both strobe synchronization and a horn silence signals on a single pair of wires.

2.7 SYSTEM COMPONENTS

A. Smoke Detectors shall be listed by UL and in the California Fire Marshal's Building Equipment Directory
   1. Smoke detectors shall be EST SIGA-PS, or approved equal for the control unit provided, utilizing an EST SIGA-SB or SB4 base.

2. The photoelectric smoke detector shall be suitable for direct insertion into air ducts up to 3 ft high and 3 ft wide with air velocities up to 5,000 ft/min. without requiring specific duct detector housings or supply tubes.
3. Each smoke detector shall be individually programmable to operate at any one of five (5) sensitivity settings. The detector shall also store pre-alarm and alternate pre-alarm sensitivity settings. Pre alarm sensitivity values shall be configurable in 5% increments of the alarm and alternate alarm sensitivity settings respectively. The detector shall be able to differentiate between a long term drift above the pre alarm threshold and fast rise above the threshold. The detector shall monitor the sensitivity of the smoke sensor. If the sensitivity shifts outside the UL limits, a trouble signal shall be sent to the panel. It shall be possible to automatically change the sensitivity of individual intelligent addressable smoke detectors for day and night (alternate) periods.
4. Each detector shall utilize an environmental compensation algorithm that shall automatically adjust for background environmental conditions such as dust, temperature, and pressure. The detector shall provide a maintenance alert signal when 80% (dirty) of the available compensation range has been used. The detector shall provide a dirty fault signal when 100% or greater compensation has been used.

B. Duct Smoke detectors shall be listed by UL and in the California Fire Marshal's Building Equipment Directory
   1. Duct smoke detectors shall be intelligent low profile photoelectric duct smoke detectors model SIGA-SD, or approved equal for the control unit provided.
   2. The intelligent duct smoke detector shall operate in ducts having from 100ft/min to 4,000ft/min air velocity. The detector shall be suitable for operation over a temperature range of -20 to 158F° and offer a harsh environment gasket option. The detector shall utilize an air exhaust tube and an air sampling inlet tube that extends into the duct air stream up to ten (10) feet. Design of the detector shall permit sampling tube installation from either side of the detector and permit sampling tube installation in 45- degree increments to ensure proper alignment with duct airflow. Drilling templates and gaskets to facilitate locating and mounting the housing shall be provided.
   3. The intelligent duct smoke detector shall obtain information from a photoelectric sensing element. The detector shall be able to differentiate between a long term drift above the pre alarm threshold and fast rise above the threshold. The detector shall monitor the sensitivity of the smoke sensor. If the sensitivity shifts outside the UL limits, a trouble signal shall be sent to the panel
   4. Each detector shall utilize an environmental compensation algorithm that shall automatically adjust for background environmental conditions such as dust, temperature, and pressure. The detector shall provide a maintenance alert signal when 80% (dirty) of the available compensation range has been used. The detector shall provide a dirty fault signal when 100% or greater compensation has been used.
   5. The intelligent duct smoke detector shall provide a form "C" auxiliary alarm relay rated at 2amps @ 30Vdc. The position of the relay contact shall be supervised by

the control panel software. Operation of the relay shall be controlled either by its respective detector processor or under program control from the control panel as required by the application. Detector relays not capable of programmed operation independent of the detector's state shall not be considered as equal. The detector shall be equipped with a local magnet-activated test switch.

6. Each duct detector shall be installed and testing in accordance with manufacturer's instructions, including pressure differential and, velocity testing. Test results shall be submitted to the County's Representative.
7. Where addressable smoke detectors are directly mounted on a low velocity ducts up to 3 ft high x 3 ft wide, provide factory mounting plate assemblies (EST SIGA-DMP) to facilitate mounting the detectors. The mounting plate shall be code gauge steel with corrosion resistant red enamel finish. The detector mounting plate shall support an addressable detector along with a standard, relay or isolator detector mounting base.

C. Manual Pull Stations shall be listed by UL and in the California Fire Marshal's Building Equipment Directory.
   1. Provide addressable single action, two stage fire alarm stations (EST SIGA-270P), or approved equal for the control unit provided.
   2. The manual station shall be suitable for mounting on North American 2 ½ deep 1-gang boxes and 1 ½ deep 4 square boxes with 1-gang covers. If indicated as surface mounted, provide manufacturer's surface back box.
   3. The fire alarm station shall be of metal construction, shall be finished in red with silver "PULL IN CASE OF FIRE" lettering, shall show visible indication of operation and incorporate an internal toggle switch for first stage alarm and key switch for second stage alarm.

D. Contact Monitoring Modules shall be listed by UL and in the California Fire Marshal's Building Equipment Directory.
   1. Monitor modules shall be provided as necessary for complete system operation and shall be EST, or approved equal for the control unit provided.

E. Relay Modules shall be listed by UL and in the California Fire Marshal's Building Equipment Directory.
   1. Relay modules shall be provided as necessary for complete system operation and shall be EST, or approved equal for the control unit provided.

F. 1. Relay modules shall be compatible with the FACU, Silent Knight, EST, or approved equal.

G. Provide addressable control relay modules to provide for the operation of roll-down door assemblies provided for protection at each elevator opening upon alarm of the elevator detector.
   1. The module shall be suitable for mounting on a North American 2 ½" (64mm) deep 1-gang box or 1 ½" (38mm) deep 4" square box with 1-gang covers.

2. The module shall provide one (1) form C dry relay contacts rated at 24Vdc @ 2 amps (pilot duty) to control external appliances or equipment. The position of the relay contact shall be confirmed by the system firmware. The relay coil shall be magnetically latched to reduce wiring and ensure 100% of the relays on the SLC can be energized at same time.
3. The addressable control relay module shall be an EDWARDS SIGA-CR, MCR, or approved equal compatible with the fire alarm control unit.

H. Firefighter's 2-way communication shall be provided at each elevator lobby. Provide stainless steel 4-state firefighter's telephone jack stations at each elevator. Stainless steel coverplate shall be painted with a durable bronze finish to match the adjacent surfaces. Provide new, durable identification lettering as noted below.
1. The jack station shall be clearly identified with the words "FIRE FIGHTER'S TELEPHONE" for use with portable fire fighter telephone handsets.
2. Plugging in a remote handset into the jack station shall signal the main fire alarm panel of an incoming phone call.
3. The firefighter's telephone jack stations shall be EDWARDS 6833-4, or approved equal compatible with the fire alarm control unit.
4. Provide five (5) 4-state firefighter's telephone handsets with push-to-talk-type controls for use with the firefighter's telephone jack stations. The telephone handsets shall be red in color and have a 5 ft. coiled cord.
5. The firefighter's telephone handsets shall be EDWARDS 6830 series, or approved equal compatible with the fire alarm control unit.

I. Combination Horn/Strobes shall be listed by UL and in the California Fire Marshal's Building Equipment Directory.
1. Combination horn/strobes shall be wall or ceiling mounted, EST, Cooper, or approved equal. They shall be mounted such that the entire strobe lens is not less than 80-inches nor more than 98-inches from the finished floor. The strobes shall meet the requirements of the ADA, UL Standard 1971, with a maximum pulse duration of 2/10 of one second and a strobe intensity meeting UL 1971.
2. Combination horn/strobes shall be powered from the FACU or listed/approved fire alarm power supply. Strobes on the same circuit or viewing area shall be synchronized. The flash rate shall meet the requirements of UL 1971.
3. Horns shall be synchronized.

J. Strobes shall be listed by UL and in the California Fire Marshal's Building Equipment Directory.
1. Strobes shall be wall or ceiling mounted, EST, Cooper, or approved equal. Wall mounted appliances shall be mounted such that the entire strobe lens is not less than 80-inches nor more than 98-inches from the finished floor. Strobes shall meet the requirements of the ADA, UL Standard 1971, with a maximum pulse duration of 2/10 of one second and a strobe intensity meeting UL 1971..
2. Strobes shall be powered from the FACU or listed/approved fire alarm power supply. Strobes on the same circuit or viewing area shall be synchronized. The flash rate shall meet the requirements of UL 1971.

2.8 CONDUIT AND WIRE

A. Conduit and wire shall be in accordance with the California Electrical Code (CEC), and NFPA 72.

B. Cable and wiring meeting the requirements of NFPA 72 and the California Electrical Code may be installed in concealed spaces (e.g. above ceilings). Cable and wire shall not be installed in ventilation ducts without specific prior written approval of the County's Representative. Cable and wiring routed in concealed areas meeting the protection requirements of the California Electrical Code (e.g. Article 760) may be routed without the use of conduit or raceway.

C. Cable and wire not installed in conduit shall have the fire resistance rating suitable for the installation as indicated in the California Electrical Code and shall be supported and protected in accordance with the California Electrical Code and the manufacturer's requirements, but shall be supported from the wall/floor assemblies at intervals not exceeding 5 ft or the manufacturer's requirements. Cable and wiring shall not be directly laid, unsupported, on ceiling surfaces.

D. Cable and wiring in exposed areas, within drops/rises, and other areas required by Code, shall be in conduit or other acceptable raceway (e.g. Wiremold). Decorative raceway (e.g. Wiremold or equal) shall be used in all finished areas. Conduit shall not be used in finished areas. Wiremold in common spaces (e.g. corridors) shall be metallic.

2.9 CONDUIT/RACEWAY

A. All wiring in exposed areas, within drops/rises, and other areas required by Code shall be installed in conduit or raceway (e.g. Wiremold or other decorative system). Raceway fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.

B. Cable must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors.

C. Wiring for 24 volt control, alarm notification, emergency communication and similar power limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits if in accordance with the manufacturer's instructions. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

D. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or back boxes, except where conduit entry is specified by the manufacturer.

E. New conduit shall be 3/4 inch minimum.

F. No conductor or cable splices shall be permitted below ground.

2.10 WIRE

A. All fire alarm system wiring must be new.

B. Wiring shall be in accordance with the California Electrical Code, Article 760 and NFPA 72 and as recommended by the manufacturer. Number and size of conductors shall be as recommended by the fire alarm system manufacturer

C. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system. Wire and cable not installed in conduit shall have the fire resistance rating suitable for the installation as indicated in the California Electrical Code and shall be supported and protected in accordance with the California Electrical Code and the manufacturer's requirements.

D. All field wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, removal of any internal modules, or any open circuits in the field wiring; a trouble signal will be activated until the system and its associated field wiring are restored to normal condition.

2.11 TERMINAL BOXES, JUNCTION BOXES AND CABINETS

A. All boxes and cabinets shall be UL listed for their use and purpose.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall be a California licensed contractor C-10), experienced in the installation of fire alarm systems.

B. The installation of the fire alarm system shall not be started until the Contractor's submittal has been approved by the County's Representative and the Authority Having Jurisdiction.

C. Install all equipment and materials in the locations required in accordance with the referenced Codes, Standards and the manufacturers' instructions. Installation shall include mounting of all control units, new conduit/raceway and wire pulled, devices and appurtenances necessary for a complete functioning system. All conflicts shall be identified to the County's Representative for clarification and correction.

D. Install all manual pull stations in accordance with NFPA 72 and where required by the referenced Codes.

E. Install all occupant notification appliances in the locations and arrangements in accordance with NFPA 72 (e.g. height of box from finished floor shall be as required for the specific type of appliance).

F. Install all components as indicated in the locations required in accordance with the referenced Codes and Standards and in accordance with the manufacturer's requirements. Assemble together all equipment which requires assembling.

G. Install all new conduit/raceway. Exposed/visible raceway and/or conduit shall be located and routed in an aesthetic and workmanlike manner (e.g. at the wall/ceiling interface, in a straight line, etc.). Exposed raceway must be specifically accepted by the County's Representative prior to installation.

H. H. Install all wiring in accordance with the California Electrical Code and NFPA 72. Pull conductors to necessary and appropriate devices and appliances.

I. Provide all necessary connections and terminations. All field and FACU wiring shall be terminated in terminal cabinets or on field devices/appliances. All connections shall be made on terminals. The necessary and appropriate cables and conductors for the future expansion of the system to the remaining five buildings shall be provided and terminated at an exterior location approved by the County's Representative.

J. Provide all initial system addressing. Use the County's room numbers or names for annunciation. Correct the Drawings to reflect the zoning used.

K. Repair damage caused by the Contract work.

L. Remove and dispose of all equipment removed as part of the Contract.

3.2 JOB CONITIONS

A. Other trades will be in the Building during the contract period. Coordinate work schedule, material deliveries etc. with the County's Representative.

B. Minimize impairments of existing fire protection system, and coordinate any proposed shutdown with the County's Representative. Restore existing fire protection systems removed from service as part of this work at the end of each working day.

C. The work performed on this Project occurs within an existing building. Equipment and material furnished and installed on the Project shall be coordinated with existing space constraints. Fabricate equipment and material such that complete systems may be broken down into sections suitable for passage through existing passageways without modification to the building unless other arrangements are made with the County's Representative to provide access.

3.3 PENETRATIONS

A. The Contractor shall be responsible for all openings and penetrations required.

B. Provide penetrations of rated assemblies with through penetration fire stop systems with "T' ratings equal to those of the assembly penetrated.

3.4 PAINTING

A. Exposed conduit may be painted by the County's work force. Clean all exposed surfaces of oil, dirt, etc. to the satisfaction of the County's Representative.

3.5 TESTING AND ACCEPTANCE

A. The Contractor shall perform a complete functional test of all devices and appliances after the installation is completed. The test shall include a complete functional test of all circuits, devices, and appliances as required in NFPA 72 and the Contract. The test shall be conducted in the presence of the County's Representative. Furnish all labor and test equipment required for these tests.

B. The test will be conducted to determine that the equipment has been properly assembled, connected and checked to verify that the intent and purpose of the Drawings, Specification, and manufacturer's requirements have been accomplished in a satisfactory manner. All failures shall be retested prior to acceptance.

C. The Contractor shall furnish a Certificate in accordance with NFPA 72.

3.6 TRAINING

A. Provide a total of 6 hours of training, in two separate sessions, to the County's personnel regarding operation and maintenance. The sessions shall include hands-on operation of the equipment by the County's personnel.

3.7 GUARANTEE

A. Except as otherwise expressly provided in the Contract Documents, and excepting only items of routine maintenance, ordinary wear and tear, abuse or neglect, Contractor guarantees all work and all supplies, materials and devices installed and delivered to the County's Representative, to be free of all defects of workmanship and materials for a period of one year after final acceptance of the entire work by the County. Final acceptance shall not take place until there is one month of continuous trouble free operation of the fire alarm system and the Certificate has been received by the County.

END OF SECTION 28 31 00

ALTERNATE NO. 1

SECTION 07 22 16

ROOF INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Roof insulation and installation.

1.02 RELATED SECTIONS

A. Section 07 55 00 – Modified Bituminous Membrane Roofing

1.03 REFERENCES

A. ASTM A-167-94a Specification for Stainless and Heat-Resisting Chromium Nickel Steel Plate, Sheet and Strip

B. ASTM A- 653 Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc - Iron Alloy-Coated (Galvanized) by the Hot-Dip Process

C. ASTM B-29 Pig Lead

D. ASTM B-32 Solder Metal

E. ASTM C-165-95 Test Method for Measuring Compressive Properties of Thermal Insulation

F. ASTM C-208-95 Specifications for Cellulosic Fiber Insulating Board

G. ASTM C-209-92 Test Method for Cellulosic Fiber Insulating Board

H. ASTM C-272-91 Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions

I. ASTM C 518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

J. ASTM C-728-91 Specification for Perlite Thermal Insulation Board

K. ASTM D-5 Test Method for Penetration of Bituminous Materials

L. ASTM D-36 Test Method for Softening Point of Bitumen (Ring and Ball Apparatus)

M. ASTM D-92 Test Method for Flash and Fire Pints by Cleveland Open Cup

N. ASTM D-312 Specification for Asphalt Used in Roofing

O. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

P. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.

Q. ASTM E 2114-01 - Standard Terminology for Sustainability Relative to the Performance of Buildings

R. ASTM 2129 -01 - Standard Practice for Data Collection for Sustainability Assessment of Building Product

S. SMACNA Sheet Metal and Air Conditioning Contractors National Association

T. UL Underwriter's Laboratories, Inc., Northbrook, Illinois

U. FS HH-I-1972 Insulation Board, Polyisocyanurate

V. WH Warnock Hersey International, Inc. Middleton, WI

1.04 SUBMITTALS

A. Product Data: Manufacturer's specifications and installation instructions for each product specified.

B. Provide approval letters from insulation manufacturer for use of their insulation within this particular roofing system type.

C. Provide a sample of each insulation type.

D. Shop Drawings:

1. Indicate complete installation details of tapered insulation system, including identification of each insulation block, sequence of installation, layout, drain locations, roof slopes, thicknesses, crickets and saddles.

2. Include: Outline of roof, location of drains and scuppers, complete board layout of tapered insulation components, thickness and the average "R" value for the completed insulation system.

E. Certifications: Submit all of the following:

1. Roof manufacturer's certification that insulation adhesive furnished are acceptable to roof manufacturer.
2. Roof manufacturer's certification that insulation furnished is acceptable to roofing manufacturer as a component of roofing system and is eligible for roof manufacturer's system warranty.
3. Certification that insulation and fastening system furnished is Tested and Approved by Factory Mutual for 1-90 Wind Up-Lift Requirements.

1.05 DESIGN REQUIREMENTS

A. No ponding of water on roof, all runoff flows to drain.

B. All roof insulation overlaid with gypsum board. No roofing installed over exposed insulation.

C. Tapered Insulation to provide a minimum ¼”slope towards drain.

1.06 PERFORMANCE REQUIREMENTS

A. General: Fire Classification, ASTM E-108; Section specifies a roof system with an external fire rating. The descriptions given below are general descriptions. The insulation, recovery board, and all other components shall be included as required by the membrane manufacturer to provide a Factory Mutual Class 1A fire resistance rating or Listed by Underwriter's Laboratories or Warnock Hersey for external fire tests of ASTM - E - 108 Class A.

B. Provide continuity of thermal barrier at building enclosure elements.

C. Flame spread less than 25 when tested in accordance with ASTM E84.

D. Smoke density less than 50 when tested in accordance with ASTM E84.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened packaging, with identifying tags or labels intact and legible.

B. Coordinate scheduling for timely deliveries and prompt installation of materials.

C. Store insulation and support system in a dry, protected area out of direct sunlight. If storage area is outdoors, store material off the ground and protected by a suitable waterproof cover.

D. Remove insulation which is warped, broken or exposed from moisture from the site.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Handle and install insulation system only under conditions and temperatures recommended by the manufacturer.

B. Coordinate insulation placement to assure that material can be covered promptly with roof. Do not leave insulation exposed overnight or to inclement weather.

1.09 WARRANTY

A. Provide warranty coordinated with the requirements of other sections specifying roof products.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturers:
   1. Manville Roofing Systems, www.jm.com
   2. Hunter, www.hpanels.com
   3. GAF, www.gaf.com.

2.02 MATERIALS

A. Polyisocyanurate Roof Insulation: Provide thicknesses of insulation as indicated, or as required to provide minimum slopes indicated or required. Provide combination of types and thicknesses to provide a complete system.
   1. Surface Burning Characteristics: Provide assembly with composite flame spread rating of 25 or less and smoke developed of 50 or less, as determined in accordance with ASTM E 84.
   2. Factory tapered, closed cell polyisocyanurate foam core.
      a. Average R-Value: Minimum 30
   3. Board insulation, closed cell polyisocyanurate foam core.
      a. Minimum thickness as indicated on roof plans and details.
      b. R-Value per inch: 5.6.
   4. Insulation board shall meet the following requirements:
      a. UL, WH or FM listed under Roofing Systems
      b. Federal Specification HH-I-1972: Class 1
      c. Dimensional Stability ASTM D2126: 2% max.
      d. Compressive Strength ASTM D1621: Grade 3, min. 25 psi.
      e. Vapor Permeability ASTM E-96: 1 perm max.
      f. Foam Core Density ASTM D1622: 2.0 pcf min.
      g. Water Absorption ASTM C209: <1 %
      h. Flame Spread ASTM E 84: 25 max.
      i. R-Factor HR per inch thickness ASTM C 518: (Design Value)

B. Related Materials:

1. Fiber Cant, crickets and Tapered Edge Strips: Performed rigid insulation units of sizes/shapes indicated or as required to achieve configurations shown, of perlite or organic fiberboard.
2. Foam insulation adhesive: Insul-Lock HR by The Garland Company or approved equal.

C. Cover Board:

1. Premolded coated gypsum board 1/2 inch thickness.

a. Georgia Pacific: ½" Densdeck Prime or approved equal.

D. Adhesive:
1. Insul-Lock E HR or approved equal

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that roof framing system is complete and ready to receive insulation system. Do not proceed with installation until unsatisfactory conditions have been corrected.
1. Verify that work which penetrates roof deck has been completed.
2. Examine surfaces for defects, rough spots, ridges, depressions, foreign material, moisture, and unevenness.
3. Do not proceed until defects are corrected.
4. Do not apply insulation until substrate is sufficiently dry, 12 percent moisture maximum, and ready to receive insulation and adhesive.
5. Broom clean substrate immediately prior to application.
6. Use additional insulation to fill depressions and low spots that would otherwise cause ponding water.

3.02 DECK PREPARATION

A. Verify flatness and tightness of joints of decking.

B. Confirm dry deck by moisture meter with 12 percent moisture maximum.

C. Place insulation boards in a method to maximize contact bedding. Notch out undersides of boards which directly cover structural fasteners or strapping which are attached to the roof deck. Make notch equal to the length, width and depth of structural strap or fastener. Install boards to prevent "bubbles", high spots or dams across direction of required drainage flow.

3.03 INSTALLATION

A. General: Install roof insulation in strict accordance with manufacturer's instructions and approved shop drawings.
1. Place boards in a method to maximize contact bedding. Notch out undersides of insulation where insulation directly covers structural fasteners which are attached to the roof deck. Make notch equal to the length, width and depth of steel strap.
2. Filler pieces of insulation require at least two fasteners per piece if size of insulation is less than four square feet.
3. All joints shall be staggered and offset a minimum of 6" from the previous layer.
4. Adhere all thermal insulation.
5. All subsequent layer shall be installed with foam insulation adhesive.
6. Complete insulation system shall provide a minimum ¼":12" slope.

3.04 CLEANING AND PROTECTION

A. Remove debris and cartons from roof deck. Protect finished work to insure that insulation remains clean and dry, ready to receive roofing membrane.

END OF SECTION

ALTERNATE NO. 1
SECTION 07 55 00
MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Torch Applied 2-Ply Asphalt Roofing

1.2 SCOPE OF WORK:

A. Remove and dispose of current roof system and gravel ballast down to structural concrete deck.

B. Inspect deck and perform any repairs as needed.

C. Area divider to be built between pedestal paver section and mechanical section. (see roof plan)

D. Adhere 1" Polyiso Insulation in Insul-Lock E HR.

E. Adhere tapered polyiso insulation to achieve a minimum ¼" slope. Adhere Densdeck Prime cover board.

F. Install 2 ply modified torch Stressply System.

G. Pedestal paver system to be installed in area indicated on roof plan. Section that is not covered to be coated with Title 24 approved Pyramic coating.

H. Install ANSI SPRI ES-1 approved edge metal.

1.3 RELATED SECTIONS

A. Section 07 22 16 – Roof Insulation: Insulation and fastening.

B. Section 07 61 00 - Sheet Metal Flashing and Trim: Weather protection for base flashings.

1.4 REFERENCES

A. ASTM D 451 - Standard Test Method for Sieve Analysis of Granular Mineral Surfacing for Asphalt Roofing Products.

B. ASTM D 1079 Standard Terminology Relating to Roofing, Waterproofing and Bituminous Materials.

C. ASTM D 1863 Standard Specification for Mineral Aggregate Used as a Protective Coating for Roofing.

D. ASTM D 5147 Standard Test Method for Sampling and Testing Modified Bituminous Sheet Materials.

E. ASTM D 6162 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.

F. ASTM E 108 - Standard Test Methods for Fire Test of Roof Coverings

G. Factory Mutual Research (FM): Roof Assembly Classifications.

H. National Roofing Contractors Association (NRCA): Roofing and Waterproofing Manual.

I. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.

J. Underwriters Laboratories, Inc. (UL): Fire Hazard Classifications.

K. Warnock Hersey (WH): Fire Hazard Classifications.

L. ANSI-SPRI ES-1 Wind Design Standard for Edge Systems used with Low Slope Roofing Systems.

M. ASCE 7, Minimum Design Loads for Buildings and Other Structures

N. UL - Fire Resistance Directory.

O. FM Approvals - Roof Coverings and/or RoofNav assembly database.

P. California Title 24 Energy Efficient Standards.

1.5 DESIGN / PERFORMANCE REQUIREMENTS

A. Perform work in accordance with all federal, state and local codes.

B. Exterior Fire Test Exposure: Roof system shall achieve a UL, FM or WH Class rating for roof slopes indicated on the Drawings as follows:
1. Factory Mutual Class A Rating.
2. Underwriters Laboratory Class A Rating.
3. Warnock Hersey Class A Rating.

C. Design Requirements:
1. Uniform Wind Uplift Load Capacity
   a. Installed roof system shall withstand negative (uplift) design wind loading pressures complying with the following criteria.
      1) Design Code: ASCE 7, Method 2 for Components and Cladding.
      2) Importance Category:
         a) III.
      3) Importance Factor of:
         a) 1.0
      4) Wind Speed: 120 mph
      5) Exposure Category:
         a) B.
      6) Design Roof Height: 60 feet.
      7) Minimum Building Width: 45 feet.
      8) Roof Pitch: 0.25:12.
      9) Roof Area Design Uplift Pressure:
         a) Zone 1 - Field of roof 18.9 psf
         b) Zone 2 - Eaves, ridges, hips and rakes 31.8 psf
         c) Zone 3 - Corners 47.8 psf
2. Live Load: 20 psf, or not to exceed original building design.
3. Dead Load:
   a. Installation of new roofing materials shall not exceed the dead load capacity of the existing roof structure.
4. Warnock Hersey
   a. ITS Directory of Listed Products
5. FM Approvals:

a. RoofNav Website

1.6 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation instructions.

C. Shop Drawings: Submit shop drawings including installation details of roofing, flashing, fastening, insulation and vapor barrier, including notation of roof slopes and fastening patterns of insulation and base modified bitumen membrane, prior to job start.

D. Design Pressure Calculations: Submit design pressure calculations for the roof area in accordance with ASCE 7 and local Building Code requirements. Include a roof system attachment analysis report, certifying the system's compliance with applicable wind load requirements before Work begins. Report shall be signed and sealed by a Professional Engineer registered in the State of the Project who has provided roof system attachment analysis for not less than 5 consecutive years.

E. Verification Samples: For each modified bituminous membrane ply product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

F. Manufacturer's Certificates: Provide to certify products meet or exceed specified requirements.

G. Test Reports: Submit test reports, prepared by an independent testing agency, for all modified bituminous sheet roofing, indicating compliance with ASTM D5147. Testing must be performed at 77 deg. F. Tests at 0 deg. F will not be considered.

H. Manufacturer's Fire Compliance Certificate: Certify that the roof system furnished is approved by Factory Mutual (FM), Underwriters Laboratories (UL), Warnock Hersey (WH) or approved third party testing facility in accordance with ASTM E108, Class A for external fire and meets local or nationally recognized building codes.

I. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic inspection and maintenance of all completed roofing work. Provide product warranty executed by the manufacturer. Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Roofing and Waterproofing Manual.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified with documented ISO 9001 certification and minimum of twelve years of documented experience and must not have been in Chapter 11 bankruptcy during the last five years.

C. Installer Qualifications: Company specializing in performing Work of this section with minimum five years documented experience and a certified Pre-Approved Garland Contractor.

D. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of roofing work while roofing work is in progress.

E. Product Certification: Provide manufacturer's certification that materials are manufactured in the

United States and conform to requirements specified herein, are chemically and physically compatible with each other, and are suitable for inclusion within the total roof system specified herein.

F. Source Limitations: Obtain all components of roof system from a single manufacturer. Secondary products that are required shall be recommended and approved in writing by the roofing system Manufacturer. Upon request of the Architect or Owner, submit Manufacturer's written approval of secondary components in list form, signed by an authorized agent of the Manufacturer.

1.8 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to commencing Work of this section.

B. Review installation procedures and coordination required with related Work.

C. Inspect and make notes of job conditions prior to installation:
1. Record minutes of the conference and provide copies to all parties present.
2. Identify all outstanding issues in writing designating the responsible party for follow-up action and the timetable for completion.
3. Installation of roofing system shall not begin until all outstanding issues are resolved to the satisfaction of the Architect.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging with labels intact until ready for installation.

B. Store all roofing materials in a dry place, on pallets or raised platforms, out of direct exposure to the elements until time of application. Store materials at least 4 inches above ground level and covered with "breathable" tarpaulins.

C. Stored in accordance with the instructions of the manufacturer prior to their application or installation. Store roll goods on end on a clean flat surface except store KEE-Stone FB 60 rolls flat on a clean flat surface. No wet or damaged materials will be used in the application.

D. Store at room temperature wherever possible, until immediately prior to installing the roll. During winter, store materials in a heated location with a 50 degree F (10 degree C) minimum temperature, removed only as needed for immediate use. Keep materials away from open flame or welding sparks.

E. Avoid stockpiling of materials on roofs without first obtaining acceptance from the Architect/Engineer.

F. Adhesive storage shall be between the range of above 40 degree F (4 degree C) and below 80 degree F (27 degree C). Area of storage shall be constructed for flammable storage.

1.10 COORDINATION

A. Coordinate Work with installing associated metal flashings as work of this section proceeds.

1.11 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.12 WARRANTY

A. Upon completion of the work, provide the Manufacturer's written and signed NDL Warranty, warranting that, if a leak develops in the roof during the term of this warranty, due either to defective material or defective workmanship by the installing contractor, the manufacturer shall provide the Owner, at the Manufacturer's expense, with the labor and material necessary to return the defective area to a watertight condition.
1. Warranty Period:
a. 30 years from date of acceptance.

B. Installer is to guarantee all work against defects in materials and workmanship for a period indicated following final acceptance of the Work.
1. Warranty Period:
a. 3 years from date of acceptance.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Garland Company, Inc. (The), which is located at: 3800 E. 91st St.; Cleveland, OH 44105; Toll Free Tel: 800-321-9336; Tel: 216-641-7500; Fax: 216-641-0633; Email: dclark@garlandind.com ; (925) 784-6701 Web:www.garlandco.com

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 TORCH APPLIED 2-PLY ASPHALT ROOFING

A. Base (Ply) Sheet:
1. HPR Torch Base:

B. Modified Cap (Ply) Sheet: One ply bonded to the prepared substrate with interplay adhesive.
1. StressPly IV Plus Mineral:

C. Flashing Base Ply:
1. HPR Torch Base:

D. Flashing Cap (Ply) Sheet
1. StressPly IV Plus Mineral:

E. Surfacing:
1. Surface Coatings
a. Pyramic:

2.3 ACCESSORIES:

A. Roof Insulation: In accordance with Section 07220.

B. Roof Insulation: Provide G-P Gypsum DenDeck Prime, G-P Gypsum DenDeck DuraGuard, USG Securrock for proper adhesion of the self-adhered base sheet in accordance with Section 07220.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Inspect and approve the deck condition, slopes and fastener backing if applicable, parapet walls, expansion joints, roof drains, stack vents, vent outlets, nailers and surfaces and elements.

C. Verify that work penetrating the roof deck, or which may otherwise affect the roofing, has been properly completed.

D. If substrate preparation and other conditions are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. General: Clean surfaces thoroughly prior to installation.
1. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
2. Fill substrate surface voids that are greater than 1/4 inch wide with an acceptable fill material.
3. Roof surface to receive roofing system shall be smooth, clean, free from loose gravel, dirt and debris, dry and structurally sound.
4. Wherever necessary, all surfaces to receive roofing materials shall be power broom and vacuumed to remove debris and loose matter prior to starting work.
5. Do not apply roofing during inclement weather. Do not apply roofing membrane to damp, frozen, dirty, or dusty surfaces.

B. Poured reinforced concrete
1. Shall be smooth, dry, clean and free of ice/frost, projections and depressions. Concrete shall be fully cured and the surface shall be broom cleaned and free of release/curing agents prior to commencement of work.
2. Prepared concrete surfaces for roofing or insulation by priming with asphalt/concrete primer conforming to ASTM D 41. Apply at a rate of approx. 1 gallon/100 sq. ft. (.4 L/m2). All primed areas shall be fully dried before proceeding with the application of the roof system. Hold back bitumen at the joints approximately 4 inches (102 mm) to prevent bitumen drippage.

C. Insulation: Roof insulation is specified in Insulation Section
1. All joints between layers should be staggered when multiple layers of insulation are installed. Insulation greater than 2.5 inches shall be installed in multiple layers.
2. Insulation shall be kept dry at all times. Install only as much insulation as can be covered with completed roofing membrane before the end of the day's work or prior to onset of inclement weather.
3. Edges shall butt tightly and all cuts shall fit neatly against adjoining surfaces to provide a smooth overall surface. Gaps of greater than 1/4 inch width shall be filled with insulation.
4. Install tapered insulation around roof drains and penetrations to provide adequate slope for proper drainage.

3.3 INSTALLATION - GENERAL

A. Install modified bitumen membranes and flashings in accordance with manufacturer's instructions and with the recommendations provided by the National Roofing Contractors Association's Roofing & Waterproofing Manual, the Asphalt Roofing Manufacturers Association, and applicable codes.

B. General: Avoid installation of modified bitumen membranes at temperatures lower than 40-45 degrees F. When work at such temperatures unavoidable use the following precautions:
1. Take extra care during cold weather installation and when ambient temperatures are affected by wind or humidity, to ensure adequate bonding is achieved between the surfaces to be joined. Use extra care at material seam welds and where adhesion of the applied product to the appropriately prepared substrate as the substrate can be affected by such temperature constraints as well.
2. Unrolling of cold materials, under low ambient conditions must be avoided to prevent the likelihood of unnecessary stress cracking. Rolls must be at least 40 degrees F at the time of

application. If the membrane roll becomes stiff or difficult to install, it must be replaced with roll from a heated storage area.

C. Commence installation of the roofing system at the lowest point of the roof (or roof area), working up the slope toward the highest point. Lap sheets shingle fashion so as to constantly shed water

D. All slopes greater than 2:12 require back-nailing to prevent slippage of the ply sheets. Use ring or spiral-shank 1 inch cap nails, or screws and plates at a rate of 1 fastener per ply (including the membrane) at each insulation stop. Place insulation stops at 16 ft. o.c. for slopes less than 3:12 and 4 feet o.c. for slopes greater than 3:12. On non-insulated systems, nail each ply directly into the deck at the rate specified above. When slope exceeds 2:12, install all plies parallel to the slope (strapping) to facilitate back nailing. Install 4 additional fasteners at the upper edge of the membrane when strapping the plies.

3.4 INSTALLATION TORCH APPLIED 2-PLY ASPHALT ROOFING

A. Base Ply: Install torch base sheet to a properly prepared substrate. Shingle in proper direction to shed water on each area of roofing.
1. Lay out the roll in the course to be followed and unroll 6 feet (1.8 m).
2. Using a roofing torch, heat the surface of the coiled portion until the burn-off backer melts away. At this point, the material is hot enough to lay into the substrate. Progressively unroll the sheet while heating and press down with your foot to insure a proper bond.
3. After the major portion of the roll is bonded, re-roll the first 6 feet (1.8 m) and bond it in a similar fashion.
4. Repeat this operation with subsequent rolls with side laps of 4 inches (101 mm) and end laps of 8 inches (203 mm).
5. Give each lap a finishing touch by passing the torch along the joint and spreading the melted bitumen evenly with a rounded trowel to insure a smooth, tight seal.
6. Extend underlayment 2 inches (50 mm) beyond top edges of cants at wall and projection bases.
7. Install base flashing ply to all perimeter and projections details.

B. Modified Cap (Ply) Sheet: Over torch base sheet underlayment, lay out the roll in the course to be followed and unroll 6 feet (1.8 m). Stagger seams over the torch base sheet seams.
1. Using a roofing torch, heat the surface of the coiled portion until the burn-off backer melts away. At this point, the material is hot enough to lay into the substrate. Progressively unroll the sheet while heating and press down with your foot to insure a proper bond.
2. After the major portion of the roll is bonded, re-roll the first 6 feet (1.8 m) and bond it in a similar fashion.
3. Repeat this operation with subsequent rolls with side laps of 4 inches (101 mm) and end laps of 8 inches (203 mm).
4. Give each lap a finishing touch by passing the torch along the joint and spreading the melted bitumen evenly with a rounded trowel to insure a smooth, tight seal.

C. Fibrous Cant Strips: Provide non-combustible perlite or glass fiber cant strips at all wall/curb detail treatments where angle changes are greater than 45 degrees. Cant may be set in approved cold adhesives, hot asphalt or mechanically attached with approved plates and fasteners.

D. Wood Blocking, Nailers and Cant Strips: Provide wood blocking, nailers and cant strips as specified in Section 06114.
1. Provide nailers at all roof perimeters and penetrations for fastening membrane flashings and sheet metal components.
2. Wood nailers should match the height of any insulation, providing a smooth and even transition between flashing and insulation areas.
3. Nailer lengths should be spaced with a minimum 1/8 inch gap for expansion and contraction between each length or change of direction.

4. Nailers and flashings should be fastened in accordance with Factory Mutual "Loss Prevention Data Sheet 1- 49, Perimeter Flashing" and be designed to be capable of resisting a minimum force of 200 lbs. /lineal foot in any direction.

E. Metal Work: Provide metal flashings, counter flashings, parapet coping caps and thru-wall flashings as specified in Section 07620 or Section 07710. Install in accordance with the SMACNA "Architectural Sheet Metal Manual" or the NRCA Roofing Waterproofing manual.

F. Termination Bar: Provide a metal termination bar or approved top edge securement at the terminus of all flashing sheets at walls and curbs. Fasten the bar a minimum of 8 inches (203 mm) o/c to achieve constant compression. Provide suitable, sealant at the top edge if required.

G. Flashing Base Ply: Seal all curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
1. Prepare all walls, penetrations, expansion joints, and other surfaces to be flashed with asphalt primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
2. Adhere modified flashing base to the underlying base flashing ply with specified flashing ply adhesive. Nail off at a minimum of 8 inches (203 mm) o.c. from the finished roof at all vertical surfaces.
3. Solidly adhere the entire sheet of flashing membrane to the substrate. Tops of all flashings that are not run up and over curb shall be secured through termination bar 6 inches (152 mm) and sealed at top
4. Seal all vertical laps of flashing membrane with a three-course application of trowel-grade mastic and fiberglass mesh.
5. Coordinate counter flashing, cap flashings, expansion joints, and similar work with modified bitumen roofing work.
6. Coordinate roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices with the roofing system work. When using mineralized cap sheet all stripping plies type IV felt / Versiply 40 shall be installed prior to cap sheet installation.

H. Flashing Cap Ply: Install flashing cap sheets by the same application method used for the base ply.
1. Seal curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
2. Prepare all walls, penetrations, expansion joints and where shown on the Drawings to be flashed with required primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
3. Adhere to the underlying base flashing ply with specified flashing ply adhesive unless otherwise specified. Nail off at a minimum of 8 inches (203 mm) o.c. from the finished roof at all vertical surfaces.
4. Coordinate counter flashing, cap flashings, expansion joints and similar work with modified bitumen roofing work as specified.
5. Coordinate roof accessories, miscellaneous sheet metal accessory items with the roofing system work.
6. All stripping shall be installed prior to flashing cap sheet installation.
7. Heat and scrape granules when welding or adhering at cut areas and seams to granular surfaces at all flashings.
8. Secure the top edge of the flashing sheet using a termination bar only when the wall surface above is waterproofed, or nailed 4 inches on center and covered with an acceptable counter flashing.

I. Roof Walkways: Provide walkways in areas indicated on the Drawings.

3.5 PROTECTION

A. Provide traffic ways, erect barriers, fences, guards, rails, enclosures, chutes and the like to protect personnel, roofs and structures, vehicles and utilities.

B. Protect exposed surfaces of finished walls with tarps to prevent damage.

C. Plywood for traffic ways required for material movement over existing roofs shall be not less than 5/8 inch (16 mm) thick.

D. In addition to the plywood listed above, an underlayment of minimum 1/2 inch (13 mm) recover board is required on new roofing.

E. Special permission shall be obtained from the Manufacturer before any traffic shall be permitted over new roofing.

3.6 FIELD QUALITY CONTROL

A. Inspection: Provide manufacturer's field observations a minimum of 3 times per work week. Provide a final inspection upon completion of the Work.
   1. Warranty shall be issued upon manufacturer's acceptance of the installation.
   2. Field observations shall be performed by a Technical Representative employed full-time by the manufacturer and whose primary job description is to assist, inspect and approve membrane installations for the manufacturer.
   3. Provide observation reports from the Technical Representative indicating procedures followed, weather conditions and any discrepancies found during inspection.
   4. Provide a final report from the Technical Representative, certifying that the roofing system has been satisfactorily installed according to the project specifications, approved details and good general roofing practice.

END OF SECTION

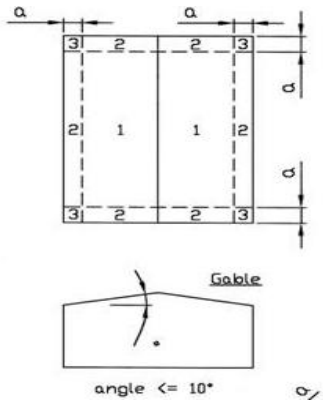
The Garland Company, Inc.
Low Slope Roofing Wind Uplift Calculations
3800 East 91st Street
Cleveland, Ohio 44105-2197
Phone: (800) 321-9336 Fax (216) 883-2046

Project **Alameda County IT Building**
Roof **Upper Roof Section**
Sales Rep. **Doug Clark** Location **Oakland, CA**

Zone 1 psf	Zone 2 psf	Zone 3 psf
18.9	**31.8**	**47.8**
(mid roof)	(eaves, ridge, hip)	(corners)

Edge Zone Width "a" **4** ft. **6** in.

Fastener Safety Factor	**N/A**
Importance	**III**
Importance Factor	**1**
Wind Speed (mph)	**120**
Ultimate Pullout Value	**N/A**
Exposure Category	**B**
Design Roof Height	**60.00**
Minimum Building Width	**45.00**
Roof Pitch (X, Y)	**0.25** : **12**



System Type:	**Modified Bitumen**	System Type:	**Modified Bitumen Torch Applied**
Surfacing:	**Coated Finish**	Attachment Method:	**Insulation Adhesive**

Zone 1 (mid roof)	Zone 2 (eaves, ridge, hip)	Zone 3 (corners)
Beads spaced _12"_ o.c. per 4' x 4' board	Beads spaced _12"_ o.c. per 4' x 4' board	Beads spaced _12"_ o.c. per 4' x 4' board

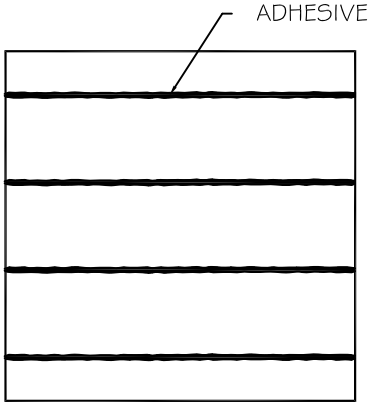
NOTES: Please note that the insulation adhesive was assumed to be Insul-Lock HR applied in 1/2" wide continuous ribbons spaced 12" o.c.

EDGE SECUREMENT: Edge metal system must be ANSI/SPRI ES-1 compliant, as required by section 1504.5 of International Building Code. Edge metal system may be an ANSI/SPRI ES-1 compliant premanufactured system, or formed by a contractor certified to fabricate an ANSI/SPRI ES-1 compliant system.

*Unless specifically stated otherwise, these calculations are based on ASCE 7-10 (American Society for Civil Engineers); if a specific building code is required, please specify.
*It is recommended to include the "Negative Uplift Pressures" in the specifications as well as the Safety Factor, Importance Factor, Building Category, Wind Speed, Ultimate Pullout Value, and Exposure.
*The Wind Speed is determined based upon geographical location.
*The Exposure and Importance Factors are needed to determine the uplift pressures.

If you have any questions, please call 800-321-9336 or respond to engineering@garlandind.com

TYPICAL ZONE 1, 2 AND 3 INSULATION BOARD ADHESIVE PATTERN: 12" OC BEADS PER BOARD



4 ADHESIVE RIBBONS
EQUALLY SPACED AT
12" (30.5cm) O.C. (TYP.)

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DETAIL:

4 X 4 BOARD PATTERN

SECTION:

INSULATION BOARD ADHESIVE PATTERN

REV: 3 28/07

The Garland Company, Inc.
3800 East 91st Street
Cleveland, Ohio 44105-2197
Phone: (800) 321-9336 Fax (216) 883-2046

PROJECT	**Alameda County IT Building**
ROOF SECTION	**Patio**
DATE	**11/30/2016**
BASIC VELOCITY PRESSURE	**26.76** psf
DESIGN CODE	**ASCE 7-10**

System & Attachment Data

SYSTEM TYPE	Modified Bitumen	
SYSTEM SCOPE	Modified Bitumen Torch Applied	
SURFACING	Coated Finish	
ATTACHMENT METHOD	Insulation Adhesive	
SUBSTRATE MATERIAL	Concrete	
SUBSTRATE THICKNESS	18 in	
FASTENER TYPE	N/A	
FASTENER SAFETY FACTOR	N/A	
ULTIMATE FASTENER PULLOUT	N/A	lbs/screw
ALLOWABLE FASTENER PULLOUT	N/A	lbs/clip

Building & Site Data

BASIC WIND SPEED	120	mph
EXPOSURE CATEGORY	B	
TOPOGRAPHY FACTOR	1.00	
BUILDING TYPE	Enclosed	
ROOF PITCH (X, Y)	0.25	12
RUN TO RIDGE	23	
EAVE HEIGHT	60	
DESIGN ROOF HEIGHT	60.00	ft
IMPORTANCE CLASS / FACTOR	III	1
MIN. BLDG WIDTH	45	ft
WIND-BORNE DEBRIS REGION	Yes	
PARAPET	No	
ROOF ANGLE	1.19	deg
PROTECTED OPENINGS	Yes	
ROOF TYPE	Gable	

	ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5		
ROOF PRESSURE (psf)	18.9	31.8	47.8	18.8	23.1		
OVERHANG PRESSURE (psf)	27.30	27.30	44.96				
EDGE ZONE WIDTH "a" =	4.50	ft					

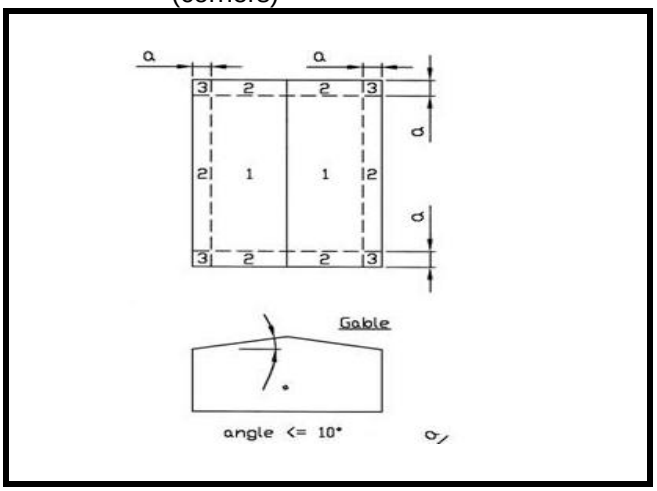
The Garland Company, Inc.
Low Slope Roofing Wind Uplift Calculations
3800 East 91st Street
Cleveland, Ohio 44105-2197
Phone: (800) 321-9336 Fax (216) 883-2046

Project **Alameda County IT Building**
Roof **Patio**
Sales Rep. **Doug Clark** Location **Oakland, CA**

Zone 1 psf	Zone 2 psf	Zone 3 psf
18.0	**30.2**	**30.2**
(mid roof)	(eaves, ridge, hip)	(corners)

Edge Zone Width "a" **13** ft. **6** in.

Fastener Safety Factor	**N/A**
Importance	**III**
Importance Factor	**1**
Wind Speed (mph)	**120**
Ultimate Pullout Value	**N/A**
Exposure Category	**B**
Design Roof Height	**50.00**
Minimum Building Width	**135.00**
Roof Pitch (X, Y)	**0.25** : **12**



System Type:	**Modified Bitumen**	System Type:	**Modified Bitumen Torch Applied**
Surfacing:	**Coated Finish**	Attachment Method:	**Insulation Adhesive**

Zone 1 (mid roof)	Zone 2 (eaves, ridge, hip)	Zone 3 (corners)
Beads spaced _12"_ o.c. per 4' x 4' board	Beads spaced _12"_ o.c. per 4' x 4' board	Beads spaced _12"_ o.c. per 4' x 4' board

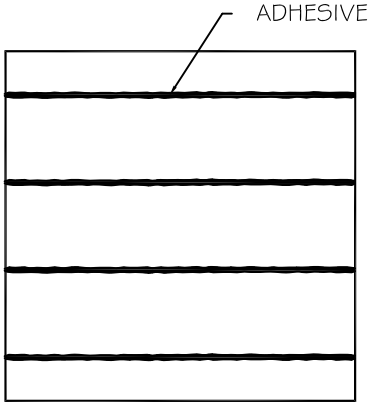
NOTES: Please note that the insulation adhesive was assumed to be Insul-Lock HR applied in 1/2" wide continuous ribbons spaced 12" o.c. A parapet wall of at least 3' tall was assumed to exist around the entire perimeter of the roof. If this is not the case, a new calculation should be performed.

EDGE SECUREMENT: Edge metal system must be ANSI/SPRI ES-1 compliant, as required by section 1504.5 of International Building Code. Edge metal system may be an ANSI/SPRI ES-1 compliant premanufactured system, or formed by a contractor certified to fabricate an ANSI/SPRI ES-1 compliant system.

*Unless specifically stated otherwise, these calculations are based on ASCE 7-10 (American Society for Civil Engineers); if a specific building code is required, please specify.
*It is recommended to include the "Negative Uplift Pressures" in the specifications as well as the Safety Factor, Importance Factor, Building Category, Wind Speed, Ultimate Pullout Value, and Exposure.
*The Wind Speed is determined based upon geographical location.
*The Exposure and Importance Factors are needed to determine the uplift pressures.

If you have any questions, please call 800-321-9336 or respond to engineering@garlandind.com

TYPICAL ZONE 1, 2 AND 3 INSULATION BOARD ADHESIVE PATTERN: 12" OC BEADS PER BOARD



4 ADHESIVE RIBBONS
EQUALLY SPACED AT
12" (30.5cm) O.C. (TYP.)

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DETAIL:

4 X 4 BOARD PATTERN

SECTION:

INSULATION BOARD ADHESIVE PATTERN

REV: 3 28/07

The Garland Company, Inc.
3800 East 91st Street
Cleveland, Ohio 44105-2197
Phone: (800) 321-9336 Fax (216) 883-2046

PROJECT	**Alameda County IT Building**
ROOF SECTION	**Patio**
DATE	**11/30/2016**
BASIC VELOCITY PRESSURE	**25.40** psf
DESIGN CODE	**ASCE 7-10**

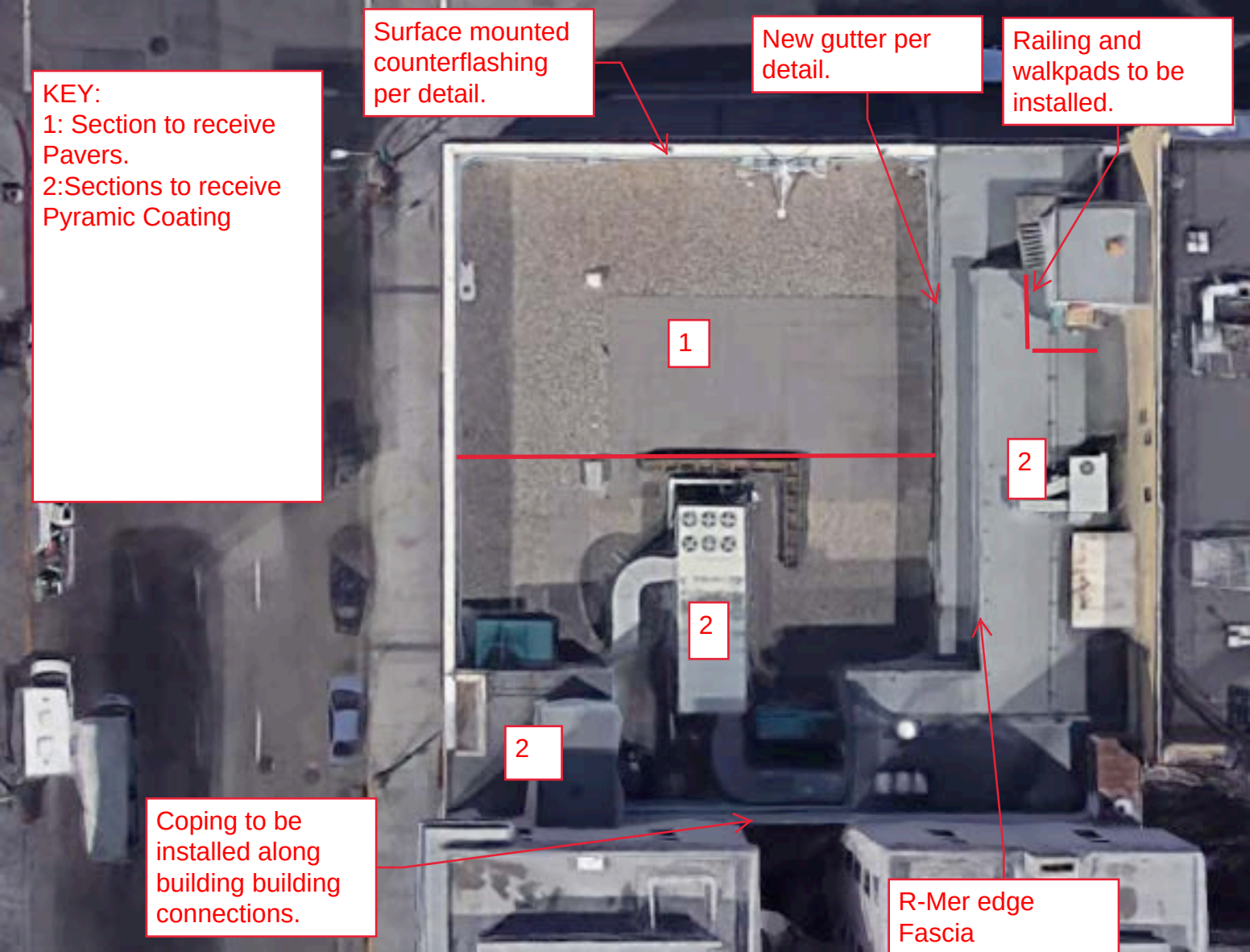
System & Attachment Data

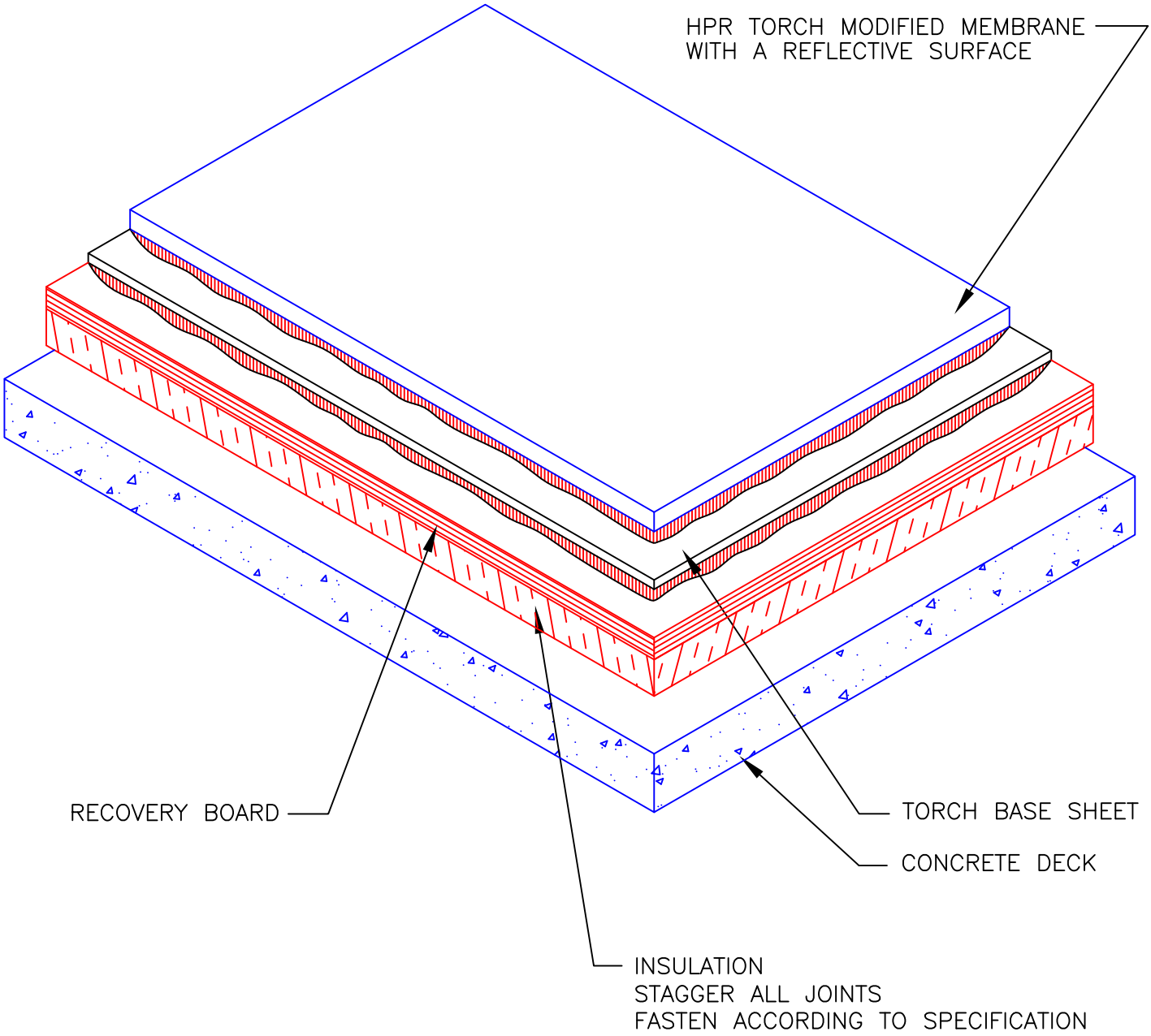
SYSTEM TYPE	Modified Bitumen	
SYSTEM SCOPE	Modified Bitumen Torch Applied	
SURFACING	Coated Finish	
ATTACHMENT METHOD	Insulation Adhesive	
SUBSTRATE MATERIAL	Concrete	
SUBSTRATE THICKNESS	18 in	
FASTENER TYPE	N/A	
FASTENER SAFETY FACTOR	N/A	
ULTIMATE FASTENER PULLOUT	N/A	lbs/screw
ALLOWABLE FASTENER PULLOUT	N/A	lbs/clip

Building & Site Data

BASIC WIND SPEED	120	mph
EXPOSURE CATEGORY	B	
TOPOGRAPHY FACTOR	1.00	
BUILDING TYPE	Enclosed	
ROOF PITCH (X, Y)	0.25	12
RUN TO RIDGE	68	
EAVE HEIGHT	50	
DESIGN ROOF HEIGHT	50.00	ft
IMPORTANCE CLASS / FACTOR	III	1
MIN. BLDG WIDTH	135	ft
WIND-BORNE DEBRIS REGION	Yes	
PARAPET	Yes	
ROOF ANGLE	1.19	deg
PROTECTED OPENINGS	Yes	
ROOF TYPE	Gable	

	ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5		
ROOF PRESSURE (psf)	18.0	30.2	30.2	17.8	21.9		
OVERHANG PRESSURE (psf)	25.91	25.91	42.68				
EDGE ZONE WIDTH "a" =	13.50	ft					


KEY:
1: Section to receive Pavers.
2:Sections to receive Pyramic Coating
Surface mounted counterflashing per detail.
New gutter per detail.
Railing and walkpads to be installed.
1
2
2
2
Coping to be installed along building building connections.
R-Mer edge Fascia



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DETAIL:

COATED FINISH

TORCH APPLIED

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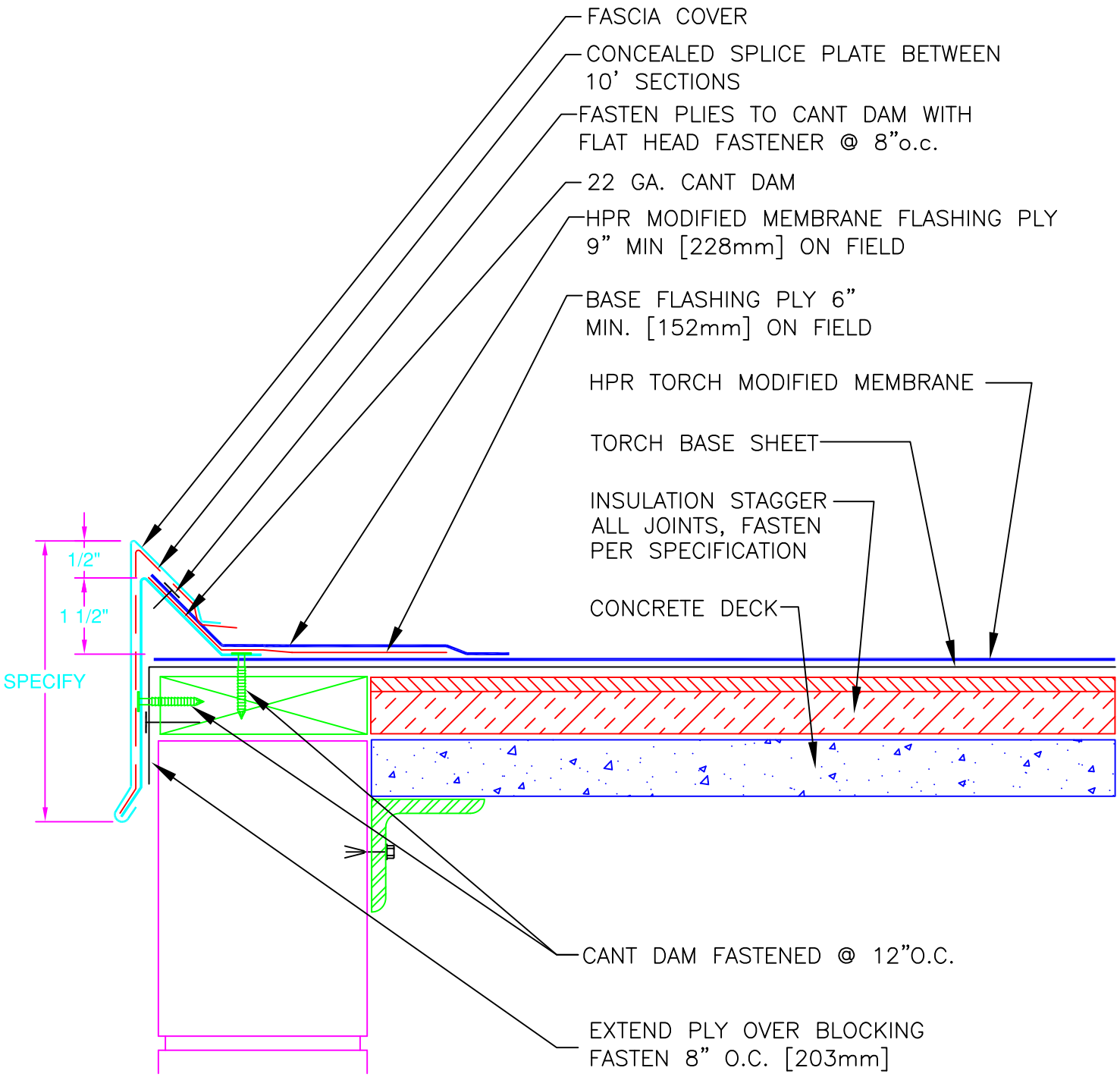

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DETAIL:
METAL ROOF EDGE

TORCH APPLIED

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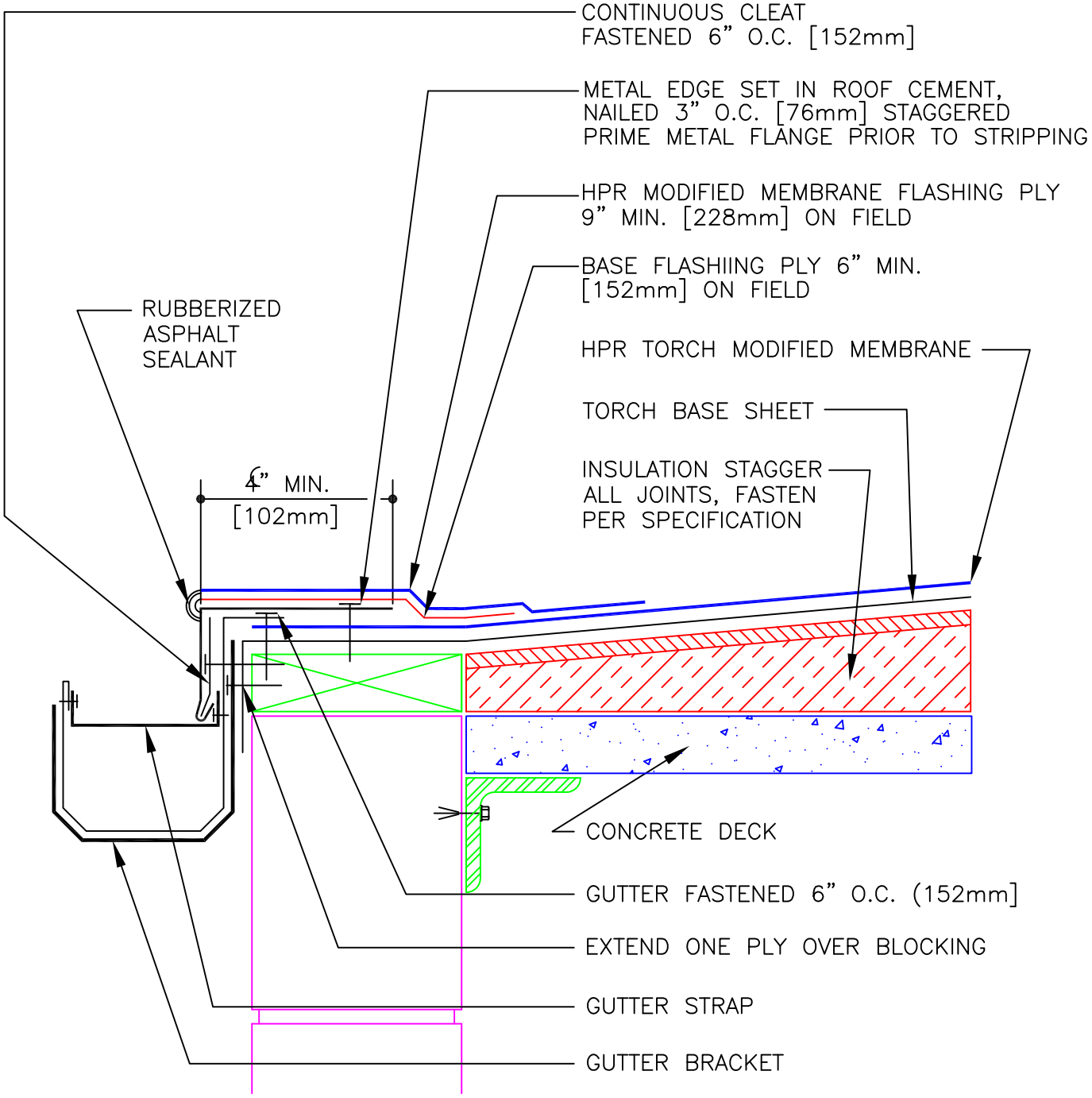

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DETAIL:

ROOF EDGE WITH GUTTER

TORCH APPLIED

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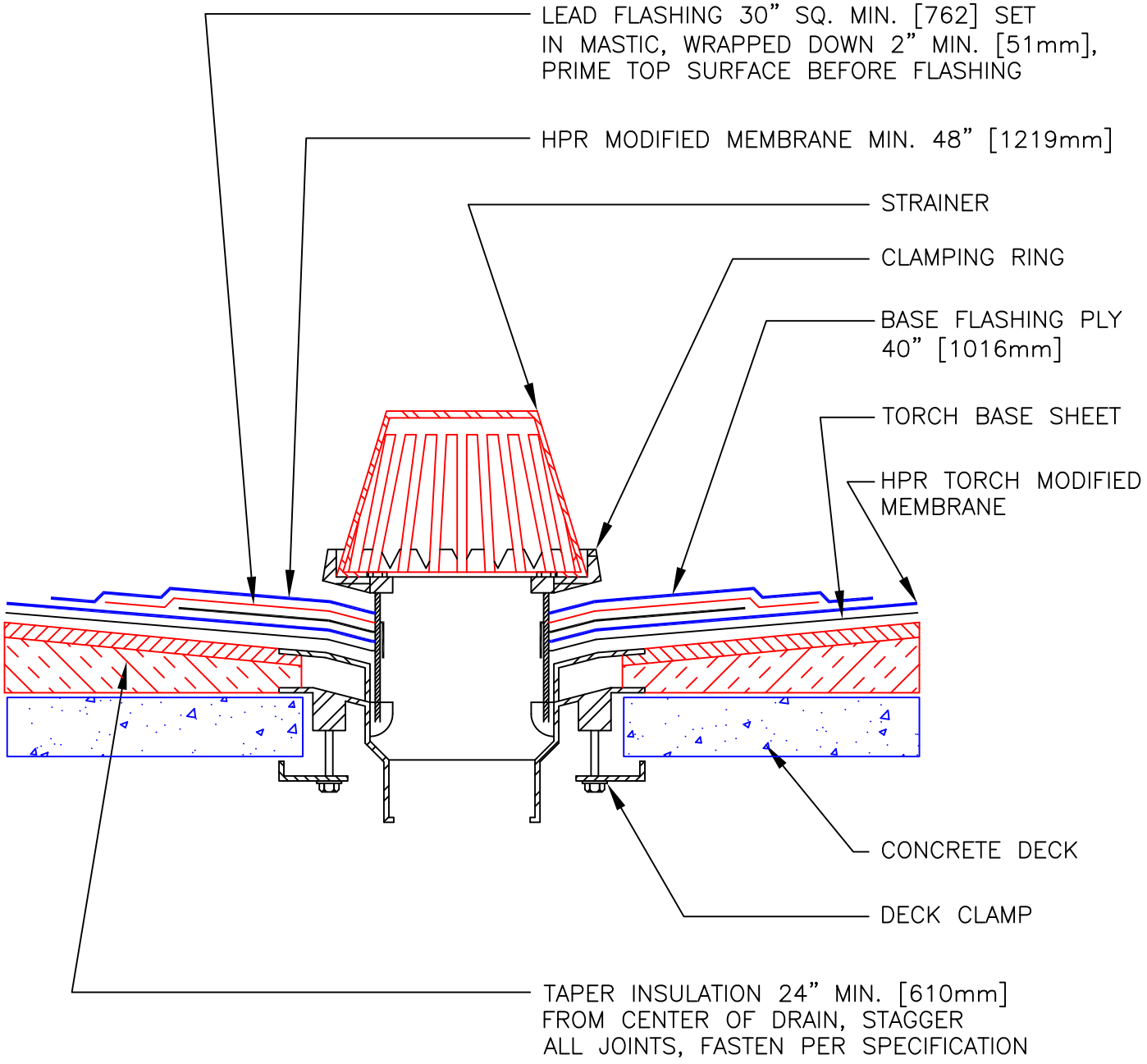

ALL PLIES SET IN MODIFIED COLD ADHESIVE SEE SPECIFICATION FOR SURFACING

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DETAIL:

ROOF DRAIN

TORCH APPLIED

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ALTERNATE NO. 1
SECTION 07 55 50
PRECAST CONCRETE PAVERS

PART ONE: GENERAL

1.1 RELATED DOCUMENTS:
- A. Roof Plan and details.

1.2 SCOPE
- A. Work Included This Section:
  1. Precast concrete paver systems.
  2. Work of this Section shall include precast concrete pavers and all accessory materials specified herein or required for complete and proper installation of the pavers system shown on the drawings and specified herein.

1.3 QUALITY ASSURANCE
- A. Manufacturer Qualifications:
  1. All products covered under this Section shall be produced by a single manufacturer unless otherwise specified.
  2. Manufacturer shall submit evidence of having not less than fifteen (15) years successful production of this product.
  3. The paver manufacturer shall demonstrate, either by proven field performance of the laboratory freeze-thaw test that the paving units have adequate durability if they are to be subjected to a freeze-thaw environment.
     a. Satisfactory field performance is indicated when units similar in composition and made with the same manufacturing process as those to be supplied to the purchaser, do not exhibit objectionable deterioration after at least 3 years.
     b. The units used as the basis for proven field performance shall have been exposed to the same general type of environment, temperature range and traffic volume as is contemplated for the units supplied to the purchaser.

1.4 SUBMITTALS
- A. Shop Drawings: Submit showing all components required for the paver installation requirements. Shop drawings shall include plan drawings showing layout of all paver areas and detail drawings showing how the various components of the systems fit together. Include manufacturer's literature completely describing all components of the paver systems and giving detailed installation recommendations and instructions. Also included detailed installation drawings for all precast.

- B. Samples for Verification Purposes:
  1. Submit samples made up of actual selected precast pavers for type, color and texture required. Include in set, samples of the full range of exposed color and texture to be expected in the completed work.

1.5 DELIVERY, STORAGE AND HANDLING
- A. Protect concrete pavers and accessory materials during shipment, storage and construction against damage.

- B. Protect cementitious materials from deterioration by moisture and temperature. Store in a dry location.

1.6 PROJECT CONDITIONS

A. Comply with manufacturer's requirement regarding weather, substrate and other project conditions.

B. Field Constructed Mock-Up: Prior to beginning production work, construct a mock-up approximately 4 foot by 4 foot for approval by the Tenant's rep. Mock-up may be located so as to be incorporated in the work after approval.

PART 2: PRODUCTS

2.1 MATERIALS

A. The paver systems specified herein are based upon products manufactured by Wausau Tile Inc., Wausau, WI 800-388-8728 Phone (715) 359-3121 Fax (715) 359-7456 E-mail wtile@wausautile.com Website www.wausautile.com

2.2 PAVER SYSTEM

A. TERRA PAVERS:

The paver system shall include the following components and all other accessory materials required for a complete and proper installation.

1. Finish and Color: Type 3 finishes and colors.
2. Precast Concrete Pavers: Paver units shall be 24" x 24" x 2" manufactured by Wausau Tile Inc.
   a. Portland Cement: ASTM Specifications C150.
   b. Aggregates: All aggregates used will be normal weight aggregate, conforming to ASTM Specifications C33.
   c. Coloring: Coloring used shall conform to ASTM Standards where applicable.
   d. Compression Strength: Each unit shall have a compression strength of 8,000 psi with no individual unit less than 7,000 psi when tested in accordance with ASTM C140.
   e. Water absorption**:** Shall not be greater than 6% according to ASTM C140.
   f. Flexural Strength: Not less than 800 psi per ASTM 293.
   g. Freeze/thaw: Durability of the paver shall meet the freeze/thaw tests in accordance with Section 8 of ASTM C67. Specimens, when tested, shall have no breakage and not greater that 1% loss in dry weight of any individual unit when subject to 50 cycles of freeze/thaw.
   h. Center load: Pavers shall support a minimum concentrated load of 1,850 lbs. When pressure is applied to a paver supported on four (4) corners. WT CL96
   i. Sizing: Permissible variations in dimensions shall not differ by more than 1/16" from width, hight, length or thickness. Standard units are manufactured with a 3/16" bevel on all four (4) sides of finished surface. Unit shall conform to a true plane and not differ by more than 1/16"in either concave and/or convex warpage.

B. PRECAST Site Walls and Wall Caps:

1. See drawings for dimensions of Site Walls and Wall Caps and locations and layouts of precast items.
2. Materials and physical properties specified hereinbefore for pavers shall apply also to these precast concrete items.
3. Texture and color of the items exposed surfaces shall be:
4. Surface Type: 3 Number: FDX1009 to match the field colored pavers.
5. Spacers, below the precast site walls, shall be stair tab units of SBR rubber furnished by the precast manufacturer, Wausau Tile, for installation.
6. Precast items shall be manufactured to the dimensions shown on the drawings with verification in field by installing contractor as necessary.

7. Precast Site Walls and Wall Caps to be furnished by the same manufacturer as the precast concrete pavers.

C. PEDESTALS AND ACCESSORIES:

1. Terra-Tabs and Shim Plates:
   a. The SBR rubber Terra-Tab units provide spacing tabs 1/8" allowing for drainage and air circulation. Terra-Tabs to have a shore hardness of 70, allowing for resiliency without sound transmission. Terra-Tab sizes to correspond with various sizes of pavers.
   b. Shim Plates (shims) are 1/8" and 1/4"thick and of various sizes to correspond with various size Terra-Tabs. Shim Plates to be of the same material as the Terra-Tab.

2. Pedestal Systems:
   Terra-Stand Pedestals:
   Accommodates various pitches and height changes of the project area. Unit has outside dimension of 7". Unit telescopes from a minimum of 2" to a maximum of 21" and can tilt to a level plane. Units to be high impact copolymer Polypropelene Terra-Tabs are used on top of this unit.

3. Reducer Pedestal System:
   Waffle Reducer: The waffle Reducer is made of high impact copolymer polypropylene. Waffle Reducer is made to accommodate height adjustments ½" to 2". An outside base diameter of 6" provides surface contract of 33 square inches. The unit consists of one base with 3 pieces of 3/8" waffle rings and 1 piece of 3/4" waffle ring.

4. Walk pad Protection Covers:
   TrafGard Roof Walkway Pads:
   Walkway pads made from recycled rubber. ½" thick and designed to protect roof membrane. 97% recycled rubber – 3% Urethane Binders. 350 psi tensile strength.

PART 3: EXECUTION

3.1 INSTALLATION OF PAVER SYSTEM

A. Inspection of deck and fixed elevation locations. All height or location problems to be corrected before installation.

B. Compare layout of deck to shop drawings or architectural drawings. All variances of field conditions to drawings to be reviewed and corrected prior to starting installation.

C. Terra-Tabs and shim plates are placed, maximum of 2 shims per location, at intersection of grid line if finished surface is to follow slope of substrates. Paver size centerlines must be adhered to.

D. Level surface installation using Terra-Stand screw-top pedestal to follow manufacturers' installation procedures. No variances to system allowed.

E. Minor height and pitch adjustments are handled with 1/8" rubber shim plates.

F. Reducer unit is used for height adjustments of between 1/2" and 2" in 3/8" increments.

G. Install Trafgard walkway pads under each pedestal. Pad should extend ½" wider than pedestal width.

3.2 TOLERANCES

A. Maximum of 1/16" height variation between adjacent pavers.

B. Individual pavers shall not vary more than 1/16" from level across width of the paver.

C. Paved areas shall not vary more than 1/4" from level in a distance of 10' measured at any location and in any direction.

D. Joints between pavers to be 3/16" or 1/8"

3.3 INSTALLATION OF PRECAST Site Walls and Wall Caps

A. Install in accordance with written instructions of the manufacturer and approved shop drawings.

B. Include all accessory materials required for a complete and proper installation.

3.4 CLEANING AND PROTECTION

A. Remove and replace pavers which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment to eliminate evidence of replacement.

B. Cleaning: Remove mortar stains and all other types of soiling from exposed paver surfaces, wash and scrub clean.

C. Provide final protection and maintain conditions in a manner acceptable to installer, which ensures paver work being without damage or deterioration at time of substantial completion.

END OF SECTION

ALTERNATE NO. 1
SECTION 07 61 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, and other items indicated on drawings and as follows:

1. Metal edge system with continuous cleats.
2. Surface mounted counterflashing.
3. Skirt flashing at curbs.
4. "L" flashing and step flashing.
5. Ladders.
6. Hatches.
7. Coping.
8. Etc.

1.02 RELATED REQUIREMENTS

A. Section 07 55 50 – Modified Bituminous Membrane Roofing

1.03 REFERENCE STANDARDS

A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

C. ASTM A792 Steel Sheet, Aluminum-Zinc Alloy-Coated, by the Hot-Dip Process

D. ASTM B 32 - Standard Specification for Solder Metal.

E. ASTM B486 Paste Solder

F. ASTM B 749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.

G. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

H. ASTM D 2178 - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.

I. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.

J. FS QQ-L-201 Specification for Lead Sheet

K. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association.

1.04 SUBMITTALS

A. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods,

flashings, terminations, and installation details.
1. For manufactured and shop fabricated gravel stops, fascia, scuppers, and all other sheet metal fabrications.
2. Indicate type, gauge and finish of metal.

B. Product data: Provide manufacturer's specification data sheets for each product:
1. Metal material characteristics and installation recommendations.
2. Submit color chart prior to material ordering and/or fabrication so that equivalent colors to those specific can be approved.

C. Manufacturer's installation instructions for reglets.

D Samples: Submit two samples 8x10 inch in size illustrating metal finish color.
1. Submit two samples, 12 x 12 inch in size illustrating typical external corner, internal corner, and valley, junction to vertical dissimilar surface, material and finish.

E. Certification:
1. Submit roof manufacturer's certifications that metal fasteners furnished are acceptable to roof manufacturer.
2. Submit roof manufacturer's certification that metal furnished is acceptable to roofing manufacturer as a component of roofing system and is eligible for roof manufacturer's system warranty.
3. Submit certification that metal and fastening system furnished is Tested and Approved by Factory Mutual for 1-90 Wind Up-Lift Requirements.

F. Provide approval letters from metal manufacturer for use of their metal within this particular roofing system type.

G. Proof of fabricator and installer qualifications.

H. ANSI-SPRI ES-1 test results for all coping and edge metal.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements, except as otherwise indicated.
1. Factory Mutual Loss Prevention Data Sheet 1-49 windstorm resistance: 1-90.

B. Manufacturer's Warranty: Pre-finished metal material shall require a written 20-year non-prorated warranty covering fade, chalking and film integrity. The material shall not show a color change greater than 5 NBS color units per ASTM D-2244 or chalking excess of 8 units per ASTM D-659. If either occurs material shall be replaced per warranty, at no cost to the Owner.

C. Contractor's Warranty: The Contractor shall provide the Owner with a notarized written warranty assuring that all sheet metal work including caulking and fasteners to be water-tight and secure for a period of five years from the date of final acceptance of the building. Warranty shall include all materials and workmanship required to repair any leaks that develop, and make good any damage to other work or equipment caused by such leaks or the repairs thereof.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened containers or packages with labels intact and legible.

B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Aluminum, ASTM B209, alloy 3105-H14, in thickness of .050" nom.

2.02 ACCESSORIES

A. Fasteners:
   1. Corrosion resistant screw fastener as recommended by metal manufacturer. Finish exposed fasteners same as flashing metal.
   2. Fastening shall conform to Factory Mutual 1-90 requirements or as stated on section details, whichever is more stringent.

B. Plastic Cement: ASTM D 4586, Type I.

2.03 FABRICATION - GENERAL

A. Fabricate in accordance with referenced standards. Form sections true to shape, accurate in size, square, and free from distortion or defects. Form pieces as recommended by SMACNA standard for conditions required.
   1. Provide reinforcements and supports as required for secure anchorage.
   2. Make joints rigid. Seams mechanically strong and soldered or sealed to make watertight
   3. Fabricate corners in one piece with legs extending 30-inches each way to field joint. Lap, rivet, and solder or seal corner seams watertight.
   4. Turn up "end dam" flanges at ends of opening sill flashing pieces, lap with wall flashing and membranes to shed water.
   5. Fabricate cleats of same material as sheet, minimum 3/4 inches wide, interlockable with sheet.
   6. Hem exposed edges on underside 1/2 inch; miter and seam corners.
   7. Solvent clean all sheet metal. Coat surfaces to be in contact with roofing or otherwise concealed with specified asphaltic paint; 0.015-inch minimum uniform thickness.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

F. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

2.04 EDGE METAL SYSTEM AND METAL COPING SYSTEM

A. R-mer Edge and R-mer Coping system by The Garland Company or approved equal.

   1. ANSI SPRI ES-1 tested and certified.

2.05 ROOF-RELATED SHEET METAL AND FLASHINGS

A. Roof-Related Sheet Metal and Flashings: As indicated, as specified in related sections, as required by roofing material manufacturers and referenced standards. Coordinate work of this

section with related sections. Provide complete systems without conflict or omission.

2.06 LADDERS, DRAINS AND HATCHES

A. Hatch: Bilco or approved equal.

1. Type S, all aluminum construction.

B. Roof Drains: zurn Z-100 or equal.

C. Ladder: Alaco Ladder

1. Fixed ladders of all aluminum construction.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

C. Beginning of installation means acceptance of existing conditions.

D. Field measure site conditions prior to fabricating work.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Install work watertight, without waves, warps, buckles, fastening stress, or distortion, allowing for expansion and contraction. Conform to referenced standards. Make metal joints watertight.

B. Fastening of metal to walls and wood blocking shall comply with SMACNA Architectural Sheet Metal Manual, Factory Mutual 1-90 wind uplift specifications and/or manufacturer's recommendations whichever is of the highest standard.

C. All accessories or other items essential to the completeness of sheet metal installation and water tight envelope of the building, whether specifically indicated or not, shall be provided.

D. Reglets: Install in accordance with manufacturer’s installation instructions.

E. Metal fascia and copings shall be secured to wood nailers at the bottom edge with a continuous cleat. Cleats shall be at least one gauge heavier than the metal it secures.

F. Install Sheet Membrane Waterproofing at closure flanges, under metal copings, caps and platforms; fully adhered, free of voids, blisters and buckling; roll as soon as practical following layout. Minimize exposure time to that period recommended by the manufacturer.

G. Flashing: Joints at 10-foot maximum spacing and at 2-1/2-feet from corners. Butt joints with 3/16-inch space centered over matching 8-inch long backing plate with sealer tape in laps.

H. Flanged flashings and roof accessories: Set on continuous sealer tape. Nail flanges through sealer tape and at 3-inch maximum spacing.

I. Isolate metal from dissimilar metal with 2 coats of specified asphaltic paint, sealer tape or other approved coating, specifically made to stop electrolytic action. Use only stainless steel fasteners to connect isolated dissimilar metals.

J. Joints, fastenings, reinforcements and supports: Sized and located as required to preclude distortion or displacement due to thermal expansion and contraction. Conceal fastenings wherever possible.

K. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

L. Flexible Flashing Installation:
1. Prime substrates as recommended by flexible flashing manufacturer, allow to dry.
2. Install flexible flashings in maximum feasible lengths to minimize lap joints.
3. Peel release paper from roll to expose rubberized asphalt and position flashing to center over joint location before applying. Move along opening or joint, being careful to put flashing as evenly as possible over the opening. Avoid fishmouths.
4. Press flashing firmly into place with heavy hand pressure. Ensure continuous and intimate contact with substrate.
5. If wrinkles develop, carefully cut out affected area and replace as outlined above.

M. Apply plastic cement compound between metal flashings and felt flashings.

N. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

O. Seal prefinished metal joints watertight.

P. Solder other metal joints for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.

Q. Connect downspouts and rain water leaders to storm sewer system. Seal connection watertight.

R. Install hatches and ladders per manufacturer's recommendations.

X. Install roof drains per manufacturer's recommendations.

3.04 FIELD QUALITY CONTROL

A. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

B. Tolerances
1. Exposed surfaces: Free of dents, scratches, abrasions, or other visible defects; clean, ready for painting.
2. Set flashings and sheet metal to straight, true lines with exposed faces aligned in plane as indicated.

3.05 SHOP FABRICATED SHEET METAL

A. Installing Contractor shall be responsible for determining if the sheet metal systems are in general conformance with roof manufacturer's recommendations.

B. Metal work shall be shop fabricated to configurations and forms in accordance with recognized sheet metal practices.

C. Hem exposed edges.

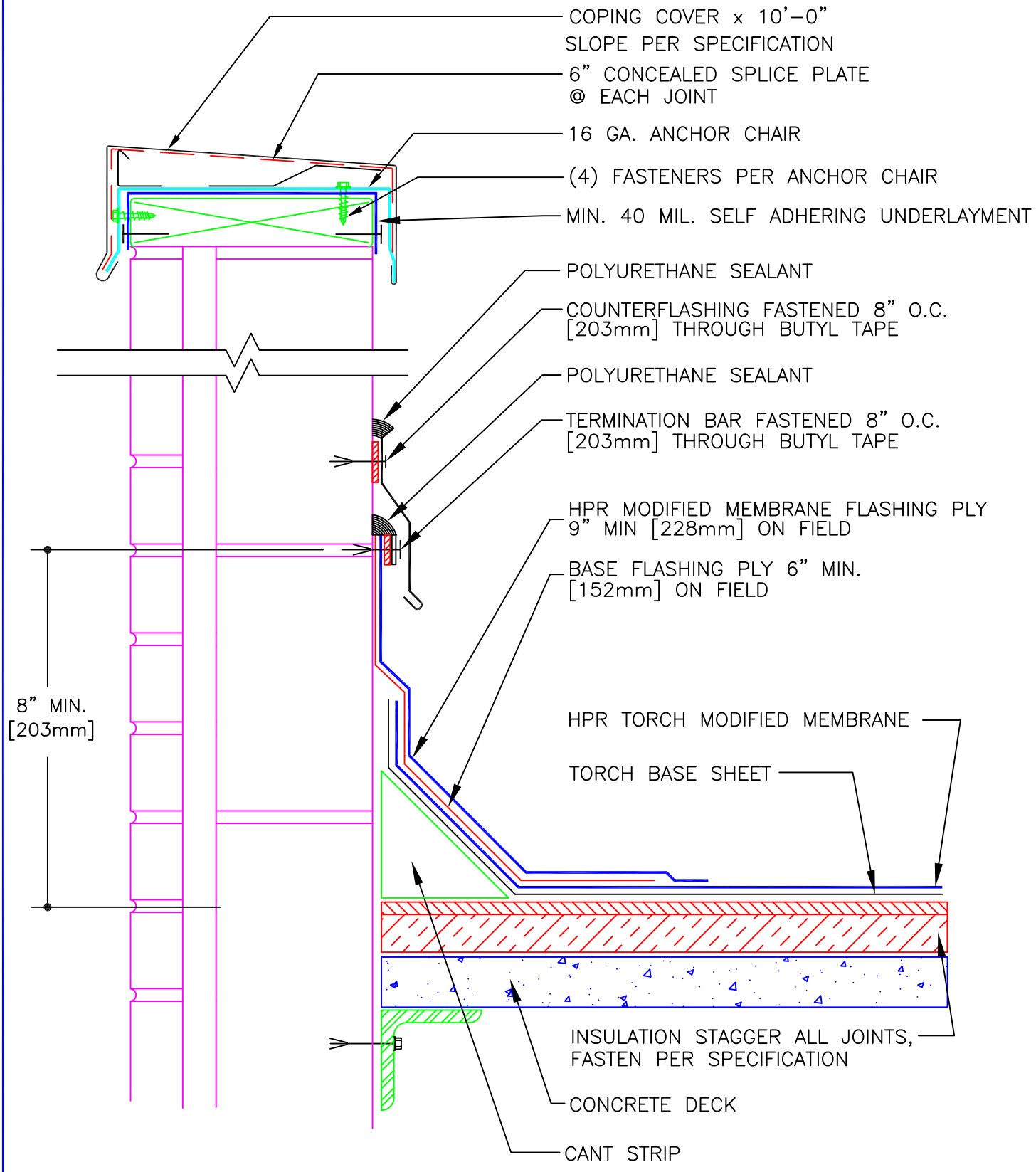
D. Angle bottom edges of exposed vertical surfaces to form drip.

E. All corners for sheet metal shall be lapped with adjoining pieces fastened and set in sealant.

F. Joints for gravel stop fascia system, cap flashing, and surface-mount counterflashing shall be formed with a 1/4" opening between sections. The opening shall be covered by a cover plate or backed by an internal drainage plate formed to the profile of fascia piece. The cover plate shall be embedded in mastic, fastened through the opening between the sections and loose locked to the drip edges.

G. Install sheet metal to comply with Architectural Sheet Metal manual, Sheet Metal and Air Conditioning Contractor's National Associations, Inc.

END OF SECTION



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DETAIL:

SURFACE MOUNTED COUNTERFLASHING

TORCH APPLIED

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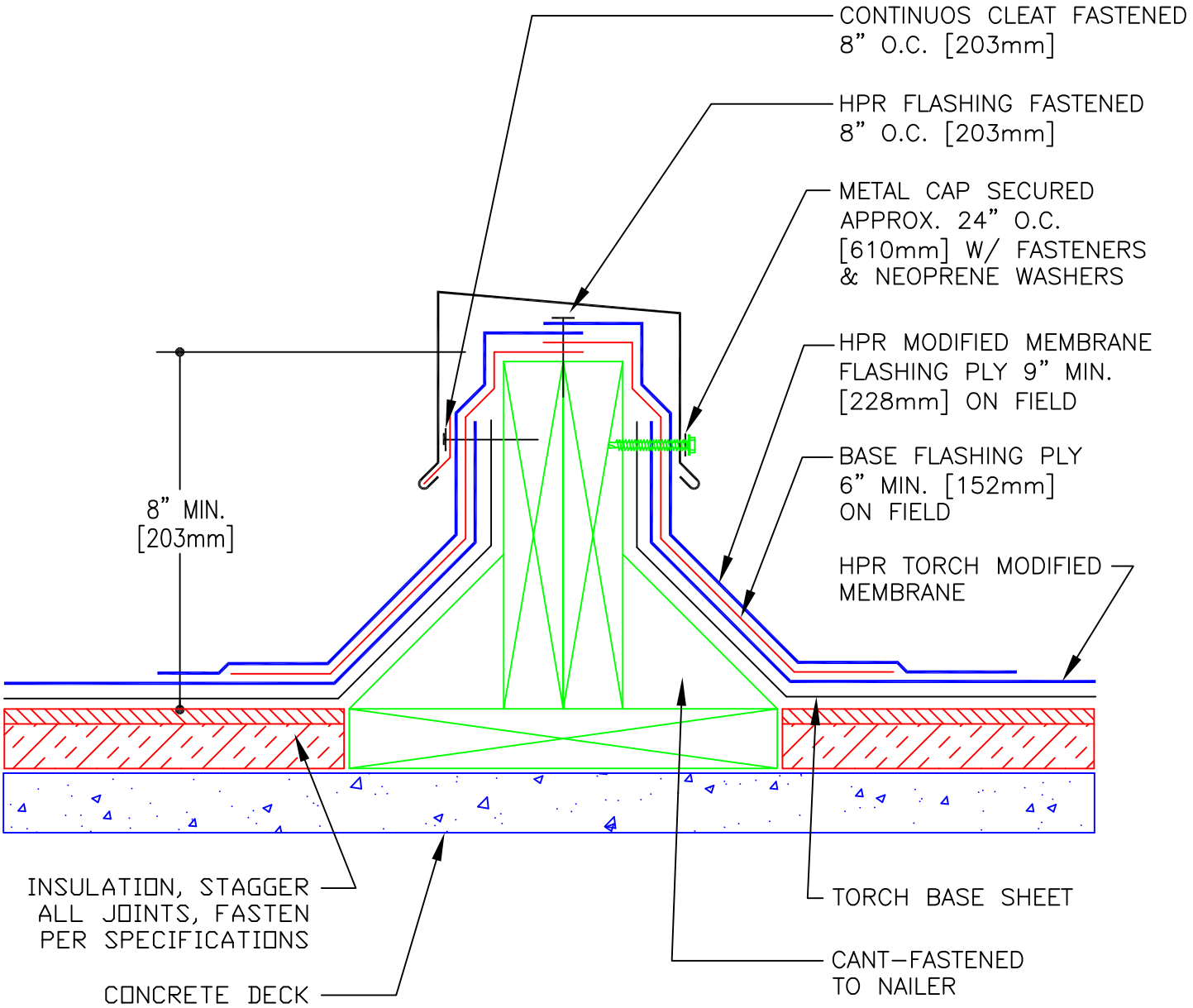

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DETAIL:

AREA DIVIDER

TORCH APPLIED

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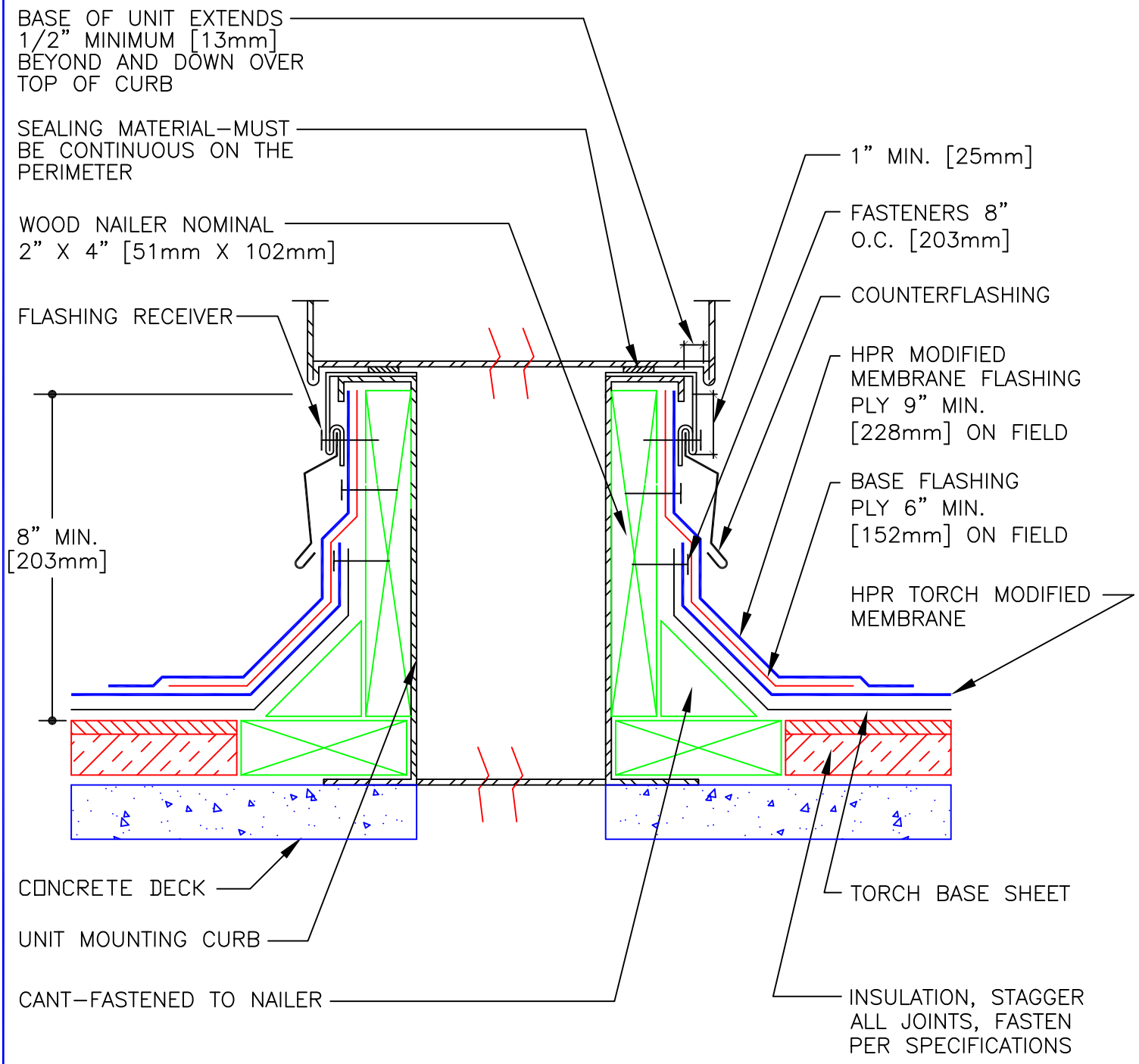

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