

DOCUMENT 00 11 16

**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:  
**Cherryland Community Center (“Project”)**
2. Sealed Bids will be received until **2:00 p.m., December 1, 2017**, at 1401 Lakeside Drive, 9<sup>th</sup> 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.

**The Project consists of:**

**The Community Development Agency, and the General Services Agency (“GSA”) have developed a design for a 18,500 square foot Cherryland Community Center for the residents of the greater unincorporated neighborhoods of Cherryland, San Lorenzo and Ashland (“Project”).**

**The Project is located at 278 Hampton Road (APN 413-35-010), 17482 Boston Road (APN 413-35-14-03) and the Meek Estate Park parking lot (APN 413-35-19-2) in the community of Cherryland in unincorporated Alameda County. The Project will be constructed on two parcels totaling approximately 56,968 square feet or approximately 1.3 acres. The total Project Area includes an existing parking lot and is approximately 2.2 acres and involves the construction of a new 17,500 square foot Cherryland Community Center and improvements to the existing Meek Estate Park parking lot. The facility will be operated and maintained by Hayward Area Recreational Parks District (“HARD”), which will operate the completed facility.**

**HARD is also contributing the Boston Road parcel to the Project site and the improvement of their nearby Meek Estate parking lot. The Cherryland Community Center will serve as a gathering place and community focal point for local residents of all ages. The Cherryland Community Center will include a lobby/reception gathering space area, a 5,000 square foot Community Event Room with adjoining courtyard and commercial kitchen, three (3) Multiple Activity Rooms, a Satellite Library, and additional space for pre-K facilities. The Cherryland Community Center will provide space for a number of uses, including wedding receptions, lectures, performances, speaking engagements, yoga, art and exercise classes; reading programs, library and computer/technology access and a diverse array of educational and recreational classes.**

**The Project site will accommodate 20 parking places. Currently with 56 places, the existing parking lot at the nearby Meek Estate will, as part of this scope, be improved and expanded to 105 total spaces.**

The budgetary estimate for the scope of work is **\$15,000,000**.

The time to complete this project is **Four hundred and eighty-five (485)** calendar days.

3. 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.
4. 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](http://www.acgov.org/sleb_query_app/gsa/sleb/query/slebmenu.jsp).
5. 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.

6. 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.
7. 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.
8. 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.
9. 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>>.

10. 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.
11. 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.
12. A mandatory pre-bid conference will be held on **November 3, 2017, 10:00 am at 1111 Jackson St., Room 242, Oakland, CA**. There is a non-mandatory networking conference held on **November 3, 2017 at 11:00 am at 1111 Jackson St., Room 242, 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.
13. Contract Documents are available on **October 20, 2017**, via:
  - A. Download:  
email request to project manager at [brian.laczko@acgov.org](mailto:brian.laczko@acgov.org) for link
  - B. Hard copies: Contract Documents are also available for purchase at East Bay Blue Print (see Attachment 1 of this document section). This fee is non-refundable.
14. 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. NONE

15. 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) )
16. Contractors must comply with County Administrative Code's CONSTRUCTION DEBRIS MANAGEMENT PRACTICES.
17. 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**.
18. The County shall award the Contract, if it awards it at all, to the lowest responsive responsible bidder based on:
  - A. **[Addendum 4] The awarded low bid must be less than or equal to a lump sum fifteen million dollars (\$15,000,000) This will be comprised of the base bid minus the deductive alternates 1-7, deducted in that order to a total sum less than or equal to a lump sum of fifteen million dollars (\$15,000,000). If the base project with all seven (7) alternates can be delivered for fifteen million dollars (\$15,000,000) or less, then all of the alternates 1-7 will be inclusive in that total final lump sum.**

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

**PLAN ROOM ADVERTISING LIST**

<input checked="" type="checkbox"/> 1 Bay Area Builders Exchange** 3055 Alvarado Street San Leandro, CA 94577 Phone: (510) 483-8880 ;Fax: (925) 685-3424 Email: <a href="mailto:planroom@bayareabx.com">planroom@bayareabx.com</a> (This is a merger of Builders Exchange of Alameda County and Contra Costa Builders Exchange 5/18/15.)	<input checked="" type="checkbox"/> 2 San Francisco Builders Exchange 850 South Van Ness Avenue San Francisco, CA 94110 Phone: (415) 282-8220 Fax: (415) 821-0363 Email: <a href="mailto:djohnsonsf@sbcglobal.net">djohnsonsf@sbcglobal.net</a>
<input type="checkbox"/> 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 <a href="mailto:gerry.mccarthy@construction.com">gerry.mccarthy@construction.com</a>	<input checked="" type="checkbox"/> 4 Small Business Exchange 703 Market Street, Suite 1000 San Francisco, CA 94103 Phone: (415) 778-6250 Fax: (415) 778-6255 Email: <a href="mailto:sbe@sbeinc.com">sbe@sbeinc.com</a>
<input checked="" type="checkbox"/> 5 Central California Builders Exchange 1244 N. Mariposa St. Fresno, Ca 93703 Phone (559) 237-1831; Fax (559) 264-2532 Email: <a href="mailto:megan@cencalbx.com">megan@cencalbx.com</a>	<input checked="" type="checkbox"/> 6 County of Alameda Current Contracting Opportunities Website located at <a href="http://www.acgov.org/gsa_app/gsa/purchasing/bid_content/contractopportunities.jsp">http://www.acgov.org/gsa_app/gsa/purchasing/bid_content/contractopportunities.jsp</a>
<input type="checkbox"/> 7 The Blue Book Building & Construction Network ( <a href="http://www.bb-bid.com">www.bb-bid.com</a> Online) Contact: Amanda Limitone, Project Communication Specialist Phone: (855) 805-2560, ext.3145; Email: <a href="mailto:alimitone@thebluebook.com">alimitone@thebluebook.com</a>	
<input type="checkbox"/> 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): <a href="mailto:docprocessing@reedbusiness.com">docprocessing@reedbusiness.com</a> -Send requests to advertise to above address/fax/phone- Local Email: <a href="mailto:jeannie.kwan@reedbusiness.com">jeannie.kwan@reedbusiness.com</a> (EPR: <a href="http://www.reedconstructiondata.com">http://www.reedconstructiondata.com</a> )	
<input checked="" type="checkbox"/> 9 East Bay Blue Print & Supply Co. 1745 Fourteenth Ave Oakland, CA 94606 Phone: (510) 261-2990 - Sandy Petty Email: <a href="mailto:ebbp@eastbayblueprint.com">ebbp@eastbayblueprint.com</a>	
<input checked="" type="checkbox"/> 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 <a href="mailto:dellithorpe@ebidboard.com">dellithorpe@ebidboard.com</a> ) <a href="mailto:planroom@ebidboard.com">Alternate: planroom@ebidboard.com</a> * <a href="mailto:ebidboard@gmail.com">ebidboard@gmail.com</a>	

\* 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

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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: **Cherryland Community Center**

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

<u>BASE BID</u>	\$ _____
_____ Dollars	\$ _____
<b><i>TOTAL BID AMOUNT</i></b>	

**Additive/Deductive Alternates:**

**Alternate #1**

_____ dollars	\$ _____
<b>(DEDUCT: REDUCE QUANTITY OF BUILDING CANOPIES)</b>	

**Alternate #2**

_____ dollars	\$ _____
<b>(DEDUCT CLERESTORY WINDOWS AT LOBBY)</b>	

**Alternate #3**

_____ dollars	\$ _____
<b>(DEDUCT EXTERIOR SUN CONTROL DEVICES)</b>	
Additive	

**Alternate #4**

_____ dollars	\$ _____
<b>(DEDUCT: REPLACE OPERABLE PARTITION AT RM 134 WITH SOLID WALL)</b>	
Additive	

**Alternate #5**

_____ dollars	\$ _____
<b>(DEDUCT NANAWALL, ADD STOREFRONT)</b>	
Additive	

**Alternate #6**

_____ dollars	\$ _____
<b>(SUBSTITUTE PERMEABLE PAVERS with POROUS ASPHALT)</b>	
Additive	

**Alternate 7**

_____ dollars	\$ _____
<b>(IMPROVEMENTS AT BOSTON PROPERTY)</b>	
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. Alternates described in section 01 22 00 .
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).

**Unit Costs, per section 01 22 00:**

**Unit Cost #1**

_____ dollars	\$ _____ per ton
<b>(Soil haul-off, for uncontaminated native earth, \$/ton)</b>	

**Unit Cost #2**

_____ dollars	\$ _____ per panel
<b>(Cutting cost only, for metal panel at architectural canopy, \$/panel)</b>	

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 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:

- F. General Conditions 00 72 13;
- G. Special Conditions 00 73 13 ;
- H. Bid Form 00 41 13;
- I. Instruction to Bidders 00 21 13.

**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. Deductive Alternate No. 1: Building Canopies
  - 1. Base Bid Item: Provide Building Canopies per Drawings 12 & 20/A7.41.
  - 2. Alternate Item: Deduct Building Canopies per Drawings 12 & 20/A7.41 and associated structural supports, flashings, gutters, downspouts. Provide exterior wall assembly and interior finishes to match adjacent surfaces.
- B. Deductive Alternate No. 2: Clerestory Windows at Lobby
  - 1. Base Bid Item: Provide window type 6 as shown on Drawings A2.41, A10.10. Provide glazing GL1 per section 088100 and roller window shade SS per section 122413.
  - 2. Alternate Item: Deduct windows, glazing and roller window shades. Provide exterior wall assembly and interior finishes to match adjacent surfaces.
- C. Deductive Alternate No. 3: Exterior Sun Control Devices
  - 1. Base Bid Item: Provide Exterior Sun Control Devices per section 107113 and Drawings A3.01, 1/A6.01, 3/A6.03 and window types 2,7,9, and 14 on A10.10. Provide glazing type GL1 per section 088100 at window types 2,7,9, and 14 on Drawing A10.10.
  - 2. Alternate Item: Deduct Exterior Sun Control Devices. Provide Glazing type GL-8 per Section 088100 at window types 2,7,9, and 14 on Drawing A10.10.
- D. Deductive Alternate No. 4: Operable Partition between Rooms 134 and 136.
  - 1. Base Bid Item: Provide Operable Partition, Door 135D, between Rooms 134 and 136 per Section 102226 and A2.22, A10.20; provide structural support beam per S.204.
  - 2. Alternate Item: Deduct Operable Partition and supporting structure. Provide Partition type A1/4/A. Change Door 135D to match Door 131D. Provide hardware per 087100 and signage.
- E. Deductive Alternate No. 5: Aluminum-Framed Folding Doors at Courtyard
  - 1. Base Bid Item: Provide Aluminum-Framed Folding doors per Section 084223, and type 23 on drawing A10.10. Provide scheduled roller window shades per section 122413.
  - 2. Alternate Item: Provide Aluminum Aluminum-Framed Storefront per Section 084113, referred to as type 31 on drawing A10.10. Provide scheduled roller window shade per section 122413.
- F. Deductive Alternate No. 6: Permeable Unit Pavers
  - 1. Base Bid Item: Provide Permeable Unit Pavers per Section 32 13 43 and Drawings C2.01a.
  - 2. Alternate Item: Deduct Permeable Unit Pavers. Provide Porous Asphalt per Section 32 12 43 and Drawings C2.01a, 2/C5.06.

G. Deductive Alternate No. 7: Improvements on Boston Property

1. Base Bid Item: Site improvements and building located on Boston Property, as delineated on Drawings C2.01a, C2.03, C3.02a, C3.03, L1.0, L1.2, L2.0, L3.1, L4.0, A1.00, A1.01, A2.01, A2.12, A2.22, A2.32, A2.42, A10.40, SG1.01, SG2.01, S2.02, S2.04, P2.2, P2.3, P2.4, P2.6, M2.2, M2.4, M3.2, E1.00, E2.32, E3.31, T1.00, T2.20, T2.30.
2. Alternate Item: Deduct all structure, finishes, equipment, mechanical, electrical, lighting, technology and fire protection systems serving the Boston Property, whether located on the parcel or not. Provide Site improvements, grading and utilities as delineated on Drawings C3.02b, 8/A3.02

**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):

- 1) Soil haul-off, for uncontaminated native earth, \$/ton**
- 2) Cutting cost only, for metal panel at architectural canopy: \$/panel**

END OF DOCUMENT

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SECTION 03 30 10 – SITE CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. This section includes all labor, materials, equipment, etc., needed to complete the installation of site concrete work in the project, including base, reinforcing, color, finishes, etc., including, but not limited to, the following:
  - 1. Pedestrian paving.
  - 2. Landscape walls.
  - 3. Landscape stairs.
  - 4. Footings.
  - 5. **[Addendum 4] Stormwater Planters.**
  - 6. **[Addendum 4] ADA ramps.**

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.4 SUMMARY

- A. The work included under this section consists of furnishing all material, supplies, equipment, tools, transportation, and facilities, and performing all labor and services necessary for, and required in connection with or properly incidental to furnishing, and installing cast-in-place concrete work as described in this section of the specifications, shown on the accompanying drawings, or reasonably implied there from, except as hereinafter specifically excluded.
- B. Work Included:
  - 1. Design of Concrete Mixes including integral color where shown on the drawings. All concrete and cement finishing; all surface treatment and curing, including non-slip finishes and color work.
  - 2. Installation of all bolts, anchors, etc.
  - 3. The furnishing of all items required to be or shown on the drawings as embedded in concrete, which are not specifically required under other sections.
  - 4. Setting headers and screeds. Curing and protecting concrete.
  - 5. Scoring and or saw-cutting control joints.
- C. This Section specifies cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.5 LEED REQUIREMENTS

- A. Refer to Section 01 35 13.20 for LEED requirements related to this Section.

1.6 SUBMITTALS

- A. Product Data: Submit data and samples for each type of finish required.
- B. Product Data for each item indicated: Manufacturer's catalog sheets including instructions for use and description of application shall be provided for each type of product indicated, including each of the following materials:
  - 1. Epoxies
  - 2. Grout
  - 3. Admixtures
  - 4. Curing Compounds
  - 5. Chemical Hardener
  - 6. Integral Colors
  - 7. Mix Designs
- C. Do not order and deliver product to job site until submittal has been approved.
- D. Design Mixtures: For each concrete mixture, submit delivery tickets at time of delivery.
- E. Samples:
  - 1. Submit the following concrete color and finish samples:
    - a. **[Addendum 4] Prior to preparing mockups (see 1.7D), for each concrete color, provide manufacturer's color chips for review and approval by Owner's Representative (see 2.4, C).**
    - b. All approved samples shall be kept at the job site for comparison with finished work.
  - 2. Joint sealant samples:
    - a. Submit to Owner's Representative manufacturer's literature, specification data, and color sample for all materials proposed for the project (see section 2.7A).
    - b. Identify their use and location.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.
- B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- C. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
  - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. **[Addendum 4] Seatwalls: Provide 12" x 15" x 36" section with top and edge treatment, reveals and finish.**
  2. Concrete Paving: Build mockups of concrete paving not less than 6 feet by 6 feet to demonstrate typical joints; surface color, pattern, and texture; curing; and standard of workmanship. Approved samples shall serve as standard for the color and finish for all subsequent concrete work for the project
  3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner's Representative specifically approves such deviations in writing.
  4. Contractor shall meet or exceed the quality of the approved finish in all subsequent work.
  5. **[Addendum 4] Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion. Otherwise, contractor shall remove the mock-ups at completion of the work.**
- E. Patching: Any surface requiring patching shall be reviewed with the Owner's Representative, prior to proceeding with the work, and shall be consistent and matching with the adjacent and surrounding surface in color and finish.
- F. Pre-installation Conference: Conduct conference at Project site with the Owner's Representative.
1. Review methods and procedures related to decorative concrete paving, including but not limited to, the following:
    - a. Concrete mixture design.
    - b. Quality control of concrete materials and decorative concrete paving construction practices.
    - c. Mockup samples.
- G. Layout of the Work: Layout and establishment of lines, levels, grades, and positions of all items that include concrete shall be done by a licensed surveyor or registered civil engineer. Obtain approval of layout by Owner's Representative prior to installation.

## PART 2 - PRODUCTS

### 2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints. The following list of materials
1. Masonite, coated plywood, steel, or other suitable material may be used provided form does not imprint concrete with grain or pattern.
  2. Plywood shall be free from loose knots, holes, and other defects, grade B-B concrete form panels conforming to PS-1.
  3. Surfaces of steel forms shall be free from irregularities, dents, and sags.

- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

## 2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615 Grade 60, deformed.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

## 2.3 CONCRETE MATERIALS

- A. Mix Design: Mix designs shall be signed by a testing laboratory approved by the Owner's Representative. Each design shall be verified by tests on cylinders prior to placement of the concrete, and compression tests shall show values at least 25% greater than the minimum strength indicated or specified, per ACI Standards, at no additional cost to the project.
  - 1. Strength:
    - a. Paving, curbs, footings: 2,500psi min., at 28 days
      - 1) Slump: 4 in.
      - 2) Max. aggregate size: 3/4in.
      - 3) Min. Sacks of cement per cubic yard: 5.5
    - b. Walls: 3,000psi min., at 28 days
      - 1) Slump: 4 in.
      - 2) Max. aggregate size: 1in.
      - 3) Min. Sacks of cement per cubic yard: 5.5
- B. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:
  - 1. Portland Cement: ASTM C 150, gray portland cement Type I. Supplement with any or all of the following:
    - a. Fly Ash: ASTM C 618, Class F.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
  - 2. Blended Hydraulic Cement: ASTM C 595, Type IS, portland blast-furnace slag; Type IP, portland-pozzolan; Type 1 (PM) pozzolan-modified Portland or Type 1 (SM) slag-modified cement.
- C. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, uniformly graded. Provide aggregates from a single source.
  - 1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
  - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Base Course

1. Base course shall be installed under paving where indicated on the drawings. Unless shown otherwise, base course shall be Class 2 aggregate, as defined in the State of California Specifications (Section 26-1).

E. Water: Potable and complying with ASTM C 94.

## 2.4 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute to water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494, Type A.
2. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
3. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
4. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.

C. Color Additives

1. Scofield Chromix Colors, as shown on the drawings. Product by L.M. Scofield Co. ([http://www.scofield.com/coloredconcrete\\_main.html](http://www.scofield.com/coloredconcrete_main.html)), or equal. **[Addendum 4] Color additives containing carbon black are not acceptable.**
  - a. Scofield contact: Bob Torres (916) 715-2717 ([bob.torres@scofield.com](mailto:bob.torres@scofield.com))
2. **Color for the following elements to be selected from Scofield's Group 1 Colors. Provide Scofield Color chips for selection by Owner's Representative:**
  - a. **Pedestrian paving #1: TBD by Owner's Representative**
  - b. **Landscape curbs and walls: TBD by Owner's Representative**
  - c. **ADA ramp: TBD by Owner's Representative.**
3. **Color for the following elements to be selected from Scofield's Group 2 Colors. Provide Scofield Color chips for selection by Owner's Representative:**
  - a. **Pedestrian paving #2: TBD by Owner's Representative**
  - b. **Landscape stairs: TBD by Owner's Representative**
  - c. **Stormwater Planters: TBD by Owner's Representative**

## 2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 1315, Type 1, Class A.

2.6 RELATED MATERIALS

- A. Expansion Joint Material: Asphalt-impregnated wood fiber board (with removable polystyrene strip on top edge).
- B. Backer Rod: Butyl rubber (of material that will not react chemically with sealant).
- C. Sealant: Self-leveling non-sagging, puncture-resistant polyurethane sealant, designed for this use. Colors to match adjacent concrete color.
- D. Semi-rigid Joint Fillers: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.

2.7 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, but not less than 30 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- D. Delivery Tickets: Submit delivery ticket (with copy for Contractor to keep) for each load of concrete delivered to the job, showing at least the following.
  - 1. Date, Name of ready-mix plant, job location.
  - 2. Contractor, and full name of Contractor's representative receiving the concrete.
  - 3. Type, brand, of cement.
  - 4. Class and specified cement contents in bags per cubic yard of concrete.
  - 5. Truck number.
  - 6. Time of loading, time dispatched.
  - 7. Time of arrival, time of unloading.
  - 8. Amount of concrete in load (in cubic yards)
  - 9. Admixtures, if any
  - 10. Maximum aggregate size and amount of aggregate of each size (per cubic yard)
  - 11. Water added at job, if any

2.8 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F reduce mixing and delivery time to 60 minutes.

### PART 3 - EXECUTION

#### 3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

#### 3.2 SUBGRADE

- A. Prepare and compact subgrade to 90% minimum compaction, unless noted otherwise, or unless indicated otherwise by the Geotechnical Engineer (by recommendation or in project report). Obtain approval from Owner's Representative prior to placing base, concrete, etc.

#### 3.3 BASE COURSE

- A. Base course shall be of the depth shown on drawings after compaction.
- B. Compact base to 95% by rolling or other approved method, unless noted otherwise.

#### 3.4 EMBEDDED ITEMS

- A. Place and secure anchorage devices, water lines, access panels, and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

#### 3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

#### 3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by the Engineer.

- C. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
- D. Score Joints: Sawcut or strike tool score joints in straight lines and in curves as shown on drawings. Joints shall be consistent, cleanly made, and with smoothed edges.
- E. Expansion Joints:
  - 1. Shall be set between separate pours, straight and true to line, top flush with finish grade, with smooth edges at surface.
  - 2. Repair damaged joints as required and as approved by Owner's Representative.
  - 3. Sealants shall be flush with adjacent surface of paving or wall.
    - a. Sealant shall be smooth, without voids or irregularities.

### 3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
  - 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
- C. Cold-Weather Placement: Comply with ACI 306.1.
- D. Hot-Weather Placement: Comply with ACI 301.

### 3.8 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
- C. Paving Finish: Paving Finish shall be Light-Medium Broom Finish, to meet the ADA requirement for coefficient of friction. Direction of pattern shall be perpendicular to direction of travel on path, or to face of wall, where adjacent to building.
- D. Wall, Curb and Band Finishes:
  - 1. Wall Finish shall be Light Sandblast, following Smooth-Finish procedure for all exposed surfaces. Sandblasting shall be done at a time, and when weather conditions are



acceptable to Owner's Representative. When operations are complete, sand shall be cleaned and removed from the site to the approval of the Owner's Representative.

- a. Light Sandblast Finish shall be evenly sandblasted after concrete has cured, to the approximately the texture of rough sandpaper. Provide 2ft x 2ft (min) sample for approval, prior to proceeding.
2. Curbs and Bands shall be Sand Finish, which shall be washed or rubbed (or sandblasted) to expose sand aggregates.
3. Where shown as Smooth Finish or Steel Trowel Finish, concrete shall be smooth, without trowel markings or roughened areas.

### 3.9 LINES AND LEVELS

- A. Finish grades on the drawings are shown in feet, to the top of all graded or paved surfaces, walls, curbs, etc. Slope uniformly between elevations shown and make transitions smooth and gradual, unless noted otherwise.
- B. Horizontal curves and radii shall be set tangent to adjacent straight lines or curves, unless noted otherwise. Curves shall be smooth and gradual.
- C. Other than minor field adjustments to meet the intent of the drawings, horizontal layout shall not vary from layout unless approved by Owner's Representative.

### 3.10 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
  1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
  2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
  3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

**3.11 CONCRETE SURFACE REPAIRS**

- A. Defective Concrete: Repair and patch defective areas when approved by Owner's Representative. Remove and replace concrete that cannot be repaired and patched to Owner Representative's approval.

**3.12 FIELD QUALITY CONTROL**

- A. Testing and Inspecting: Contractor may engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

- 1. Testing Services: Tests shall be performed according to ACI 301.

**END OF SECTION 03 30 10**

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SECTION 05 50 10 – SITE METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Section Includes: Miscellaneous metal fabrications and related connections including but not limited to the following:
  - 1. Handrails at Steps
  - 2. Handrails at ADA Ramp

1.3 RELATED SECTIONS

- A. Section 03 00 10 – Cast in Place Concrete, for footings, landscape walls, and curbs.

1.4 REFERENCES

- A. The editions referenced herein of Federal Specifications (Fed. Spec.) and of the other standards and specifications published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 30 00 for information concerning availability and use of references.
  - 1. American National Standards Institute (ANSI)
  - 2. Aluminum Association (AA)
  - 3. American Institute of Steel Construction (AISC)
  - 4. American National Standards Institute (ANSI)
  - 5. American Society for Testing and Materials (ASTM)
  - 6. American Welding Society (AWS)
  - 7. National Association of Architectural Metal Manufacturer's (NAAMM)

1.5 SUBMITTALS

- A. Shop Drawings:
  - 1. Submit shop drawings of metal work as shown in drawings and specifications, giving sizes, details of fabrication and construction, methods of assembly and bracing, and locations of hardware, anchors, and accessories.
  - 2. Contractor shall be responsible for all fabrication and for correct fitting of metal members shown on shop drawings.
- B. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.
- C. Submittal procedures and quantities are specified in Section 01 30 00.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials against weather and contact with damp or wet surfaces.
- A. Deliver material in time to insure uninterrupted progress of the work. Store materials in a manner to preclude damage and permit ready access for inspection and identification of each shipment. Store steel materials, either plain or fabricated, above the ground upon platforms, pallets, skids, or other supports. Keep materials free from dirt, grease, and other foreign matter, and protect from corrosion. Material showing evidence of damage will be rejected; immediately remove rejected materials from the work.

1.7 FIELD MEASUREMENTS:

- A. Secure all field measurements required for proper and adequate fabrication and installation of the work. Furnish templates for exact location of items to be embedded in concrete and masonry and setting instructions required for all installation work.

1.8 COORDINATION:

- A. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS:

- A. Ferrous Metal:
  - 1. Steel, Rolled Shapes, Bars and Plates: Standard structural sections, ASTM A 36-03a.
  - 2. Steel Tubing: ASTM A 500-03 or ASTM A 501-01, grade B, seamless.
  - 3. Steel Pipe: ASTM A 53-02, Type E or S, Grade B, schedule 40, unless otherwise specified.
  - 4. Stainless-Steel Bars and Shapes: ASTM A 276, Type 316L.
  - 5. Anchors, Bolts, and Fastenings: and ASTM A588.
  - 6. Electrodes: AWS A5.1 or A5.5 E70XX.
  - 7. Pipe Sleeves: Pipe sleeves through concrete walls and footings shall be standard weight, wrought iron, mild steel, or cast-iron sleeves with not less than 1/2 inch space all around between the sleeve and pipe.

2.2 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 Class Fe/Zn 5, at exterior walls.

1. Provide stainless-steel fasteners for fastening aluminum.
  2. Provide stainless-steel fasteners for fastening stainless steel.
  3. Provide stainless-steel fasteners for fastening nickel silver.
  4. Provide bronze fasteners for fastening bronze.
- B. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- C. Post-Installed Anchors: Torque-controlled expansion anchors.
1. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 (A1) Group 2 (A4) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

## 2.3 MISCELLANEOUS MATERIALS

- A. Powdercoating:
1. Submit description of method and depth of coating for approval, prior to commencing powdercoat, where indicated on drawings.
- B. Shop Primer:
1. Acceptable Products: Provide one of the following products or equal product approved in accordance with Section 01600:
    - a. Carboline Co.; No. GP-20 or GP-818
    - b. Rust-O-Leum Corp.; No. 678 or 7669
    - c. The Sherwin Williams Co.; No. B50 N 2 or B50N Z 6
    - d. Tnemec Co., Inc.; 10-99 or P10-99
  2. Composition: Fast curing, lead and chromate free, modified alkyd primer.
- C. Galvanizing Repair Compound:
1. Available Products: Provide one of the following products or equal product complying with the specified requirements:
    - a. Cominco, Ltd.; GalvaGuard
    - b. Keeler & Long; Kolorane Zinc Rich Primer #9700
    - c. ZRC Worldwide; ZRC Cold Galvanizing Compound
  2. Requirements: High zinc dust content galvanizing repair paint or cold or hot applied zinc rich material complying with ASTM A 780-01.
- D. Quick Setting Hydraulic Cement: Provide one of the following available products or equal product approved according to Section 01600.
- a. Burke/Edoco Construction Chemicals; Burke Stone
  - b. Dayton Superior Chemical Division; Ankertite Cement
  - c. Lambert Corp.; Super Por-Rok
  - d. Tamms Industries Co.; Rapid Rock
- E. Nonmetallic, Non-shrink Grout
1. Available Products: Provide one of the following products or equal product complying with the specified requirements:

- a. Burke/Edoco Construction Chemicals: Burke NFNS
  - b. Dayton Superior Chemical Division; Sure-Grip Grout
  - c. Tamms Industries Co.; Horn Grout
2. Requirements: For grout in exposed to view locations use premixed, nonmetallic, non-corrosive, non-staining grouting compound containing silica sands, portland cement, shrinkage compensating agents and water reducing agents, meeting the requirements of ASTM C 1107-02.

#### 2.4 FABRICATION:

- A. Metal Surfaces: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
- B. Fabricate and assemble materials in the shop to the greatest extent possible. Perform shearing, flame cutting, and chipping carefully and accurately. Coordinate all connection details to concrete or masonry. Verify all lines, levels, and dimensions, where possible, just before commencing fabrication of connection details. Correct work that does not fit. Schedule and coordinate work under this section with that specified elsewhere in order to produce a workmanlike installation. When not otherwise indicated or specified, comply with applicable requirements of AISC "Specifications for Design, Fabrication and Erection of Structural Steel for Buildings". Finish surfaces of exposed members smooth and free of markings, burrs, or other defects.
- C. Bolt, braze or weld connections as indicated. One-sided or other types of eccentric connections will not be permitted unless indicated, and shown in detail on the shop drawings.
- D. Cut, drill, or punch holes at right angles to the surface of the metal; do not enlarge by burning. Drill holes in base or bearing plates. Provide holes in members to permit connecting the work of other trades.
- E. Galvanizing:
  1. Galvanizing for rolled, pressed and forged steel shapes, plates, bars and strip and for assembled steel products: Zinc coating meeting the requirements of ASTM A 123-02.
  2. Galvanizing for iron and steel hardware: Zinc coating meeting the requirements of ASTM A 153-03.
- F. Shop Painting: Apply shop primer to surfaces of metal fabrications except those which are galvanized or indicated to be embedded in concrete or masonry, unless otherwise indicated.

#### 2.5 MISCELLANEOUS ROLLED STEEL PLATES AND SHAPES:

- A. Support Framing for Mechanical and Electrical and Other Equipment: Fabricate of structural steel angles or other shapes as indicated or required, to support the full weight of the equipment. All connections shall be fully welded together.
- B. Edge and Corner Guards: Fabricate from steel angles and furnish with welded anchors spaced as indicated but not less than 6 feet on centers if not shown.

- C. Shop prime exposed steel surfaces of interior steel items and galvanize exposed steel surfaces of exterior steel items if noted on drawings.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

#### 3.3 GENERAL REQUIREMENTS:

- A. Steel and miscellaneous metal work shall conform with the applicable requirements of the referenced "Codes and Standards". Details indicated are typical, similar details apply to similar conditions. Check drawings for dimensions, elevation, size, and locations of installations. Supply miscellaneous metal items in ample time for incorporation in the work. Include reinforcing angles, plates, straps, brackets, hangers, clips, lugs, holes, sleeves, shims, other hardware as indicated or required for erection of steel and miscellaneous metal work and as required to complete the work as indicated.

#### 3.4 WELDED CONNECTIONS:

- A. All welders shall be certified qualified welders. All welders welding light gage metal shall be qualified for light gage metal welding.
- B. Welded connections shall be made in accordance with AWS D1.1-. All welding shall be done in the shop unless otherwise indicated or specified.
- C. All welds and other connections exposed in the finished work shall be ground and dressed smooth and so that the shape and profile of the item welded is preserved.

#### 3.5 INSTALLATION:

- A. Per manufacturer's recommendation and per direction of the City Representative.

#### 3.6 GALVANIZED FINISH:

- A. Touch up all damaged galvanized finish due to installation, welding, threading or other work with treatment specified herein.

#### 3.7 ADJUSTING

- A. Replace work that is damaged or does not comply with requirements. Work may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

**3.8 CLEANING**

- A. Clean all installed items of markings such as pencil, ink marks, and pipe markings.
- B. Clean finished work on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Clear the work area of debris, using containers provided by the General Contractor.
- D. Leave area of work broom clean.

**3.9 PROTECTION**

- A. Protect installed products from damage from weather and other causes during remainder of the construction period.

END OF SECTION 05 50 10



**SECTION 05 70 00 – DECORATIVE METAL [Addendum 4]**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTIONS INCLUDES

- A. Point-supported glass structural canopy assemblies of the following types:
  - 1. Glazed canopies.
  - 2. Glazed canopies with cut metal panels.
- B. Glazing accessories.

1.3 RELATED SECTIONS

- A. Document 00 73 73.01 – Public Art Program: Pattern and design for cut metal panels included with point-supported glass system.
- B. Section 05 12 13 – Architecturally Exposed Structural Steel Framing: Steel canopy supports.
- C. Section 08 81 00 – Glass Glazing: glazing for canopies.
- D. Section 09 96 10 – High Performance Coatings: Finish for cut metal panels.

1.4 LEED REQUIREMENTS

- A. Refer to Section 01 35 13.20 for LEED requirements related to this Section.

1.5 REFERENCES

- A. Reference Standards: In addition to requirements shown or specified, comply with applicable provisions of following for design, materials, fabrication, and installation of component parts:
  - 1. AAMA/NWWDA 101/I.S.2 (AAMA 101).

1.6 SYSTEM DESCRIPTION

- A. Design Requirements:
  - 1. Manufacturer: Responsible for designing system, including anchorage to structural system and necessary modifications to meet specified requirements and maintain visual design concepts.

2. Employ registered professional engineer, licensed to practice structural engineering in the jurisdiction where the Project is located, to engineer each component of the glazing system.
  3. Drawings: Diagrammatic and intended to establish basic dimension of units, sight lines, and profiles of units.
  4. Provide concealed fastening wherever possible.
  5. Attachment Considerations: Account for site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening and fracturing connection between piping and units.
  6. Maximum Allowable Deflection: See Structural Drawings.
- B. Glazing Requirements: ANSI Z97.1 and CPSC Title 16 Part 1201 (16 CFR 1201):
1. Basic System with wire glass units: No free passage at 12 inch and 18 inch impact drops.
  2. Basic System with safety film: No free passage at 48 inch impact drops.
- C. Interface With Adjacent Systems:
1. Integrate design and connections with adjacent construction.

#### 1.7 ACTION SUBMITTALS

- A. Product Data: Include construction details for translucent linear glass units, framing system, and glazing accessories, material descriptions, dimensions of individual components and profiles, and finishes for assemblies.
1. Include sample of warranty customized for this Project.
- B. Shop Drawings: Show large scale construction of various parts, methods of joining, thickness of metals, profiles of surfaces, reinforcing, anchorage, and structural supports. Include information regarding concealed and exposed joints, welds, and fastenings. Where welded connectors and concrete inserts are required to receive work, show size and locations required.
1. Include plans, elevations, sections, details, and attachments to other work.
  2. Submit for plan, elevation, connection details, installation details, and interface with adjacent construction.
  3. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples: Submit 12-inch (300 mm) length by full panel width in size illustrating full range of color and appearance.
- D. LEED Submittals: See Section 01 35 13.26 for additional requirements; provide the following:
1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
    - a. Include statement indicating costs for each product having recycled content.
  2. Product Data for Credit MR 5: For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

3. Product Data for Credit IEQ 4.1: For installation adhesives, including printed statement of VOC content and chemical composition of each product used.
  4. Product Data for Credit IEQ 4.2: For field-applied touch up primers, paints, clear coatings, and galvanizing agents, include printed statement of VOC content and chemical components.
- E. CALGreen Submittals: Provide product data for the following:
1. For CALGreen 5.504.4.3 – Finish Material Pollutant Control, Paints and Coatings: Product data and material safety data sheets (MSDS) for coatings, including printed statement of chemical composition and VOC content of each product used.
- F. Fabrication Sample: Of each framing system intersection of assemblies, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:
1. Joinery.
  2. Anchorage.
  3. Expansion provisions.
  4. Structured polycarbonate panels.
  5. Flashing and drainage.
  6. A complete isometric drawing of assemblies, included in the shop drawings, will be accepted in lieu of a fabrication sample.
- G. Delegated-Design Submittal: For point supported structural glass systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- 1.8 INFORMATIONAL SUBMITTALS
- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for assemblies.
- B. ICC-ES Reports: Submit ICC-ES reports for expansion bolts, demonstrating acceptability of expansion bolts to authorities having jurisdiction over the Work.
- C. Submit following packaged separately from other submittals:
1. Test Reports: Certified test reports showing compliance with specified design requirements
  2. Certifications specified in Quality Assurance article.
  3. Manufacturer's instructions.
  4. Manufacturer's field reports.
- D. Preconstruction Test Reports: For assemblies.
- E. Field quality-control reports.
- F. Sample Warranties: For special warranties.
- 1.9 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For assemblies to include in maintenance manuals.

1.10 QUALITY ASSURANCE

- A. Installer Qualifications: Capable of assuming engineering responsibility and performing Work of this Section and who is acceptable to manufacturer.
  - 1. Engineering Responsibility: Preparation of data for point supported structural glass systems including the following:
    - a. Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.
    - b. Shop Drawings, Project-specific preconstruction-testing program development, and comprehensive engineering analysis by a qualified professional engineer.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of point supported structural glass systems that are similar to those indicated for this Project in material, design, and extent.
- C. Manufacturer's Field Representative:
  - 1. During installation, provide services of manufacturer's field representative knowledgeable of erection process for proposed glass facade.
  - 2. Manufacturer's representative shall observe installation, quality control, and certify work meets specified requirements.
  - 3. Manufacturer's representative shall submit report covering observations, procedures, noted deficiencies, corrective measures, and certification of proper installation.
- D. Single Source Responsibility: Design, structural engineering, and custom fabrication for glass facade and supply of all components, materials, and products shall be sole responsibility of single manufacturer. Provision of products from numerous sources for site assembly without complete single source design and supply responsibility is not acceptable. Components to be fabricated or supplied by single source are:
  - 1. Support framing.
  - 2. Glass as specified in Section 08 81 00.
  - 3. Connectors, fittings, anchors, and installation accessories.
  - 4. Doors and frames.
  - 5. Door hardware as specified in Section 08 71 00.
  - 6. Gaskets, glazing tape, and sealants.
  - 7. All other components, products, and materials required for complete, functional glass facade.
- E. Welding Standards: As follows:
  - 1. AWS D1.3, "Structural Welding Code - Steel Sheet".
  - 2. AWS D1.6, "Structural Welding Code--Stainless Steel."
  - 3. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- F. Certifications:

1. Certificates verifying AWS qualifications for each welder employed on Project.
2. Engineering Certifications.

1.11 MOCKUPS

- A. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build full size mock-up panel of typical assembly area as shown on Drawings.
  2. Locate as directed by Architect.
  3. Field testing shall be performed on mockups according to requirements in Part 3 "Field Quality Control" Article.
  4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.12 PRE-INSTALLATION CONFERENCE

- A. Convene a pre-installation conference one week prior to commencing work of this section. Conduct conference at Project site. Conference shall be attended by Contractor, Owner, Architect, system Installer and his foreman, system manufacturer's representative, and installers whose work interfaces with or affects linear glass window assembly.
1. Review structural load limitations.
  2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  3. Review required testing, inspecting, and certifying procedures.
  4. Identify access to site, storage, sequencing, and scheduling.
  5. Establish requirements for visits by manufacturer's field engineer.
  6. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  7. Review and discuss the finishing of structural glass system that is required to be coordinated with the finishing of other components for color and finish matching.
  8. Review, discuss, and coordinate the interrelationship of structural glass system with other exterior wall components. Include provisions for structural anchorage, glazing, flashing, weeping, sealants, and protection of finishes.
  9. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
  10. Approved mock-up to be used a measure of acceptance.
  11. Review installation of all glass doors in structural glass system.
  12. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.13 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle packaged materials in original containers with seals unbroken and labels intact until time of use.
- B. Discharge materials carefully and store on clean concrete surface or raised platform in safe, dry area.

1.14 PROJECT CONDITIONS

- A. Field Measurements: Verify linear glass window assembly system by field measurements before fabrication and indicate measurements on Shop Drawings.

1.15 SCHEDULING, SEQUENCING

- A. Ensure timely fabrication of items to be embedded or enclosed by other work.
- B. Furnish information and assistance required for locating embedded items and be responsible for proper locations.

1.16 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of point-supported structural glass system that do not comply with requirements or that fail in materials, fabrication, or installation within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Noise or vibration caused by thermal movements.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    - d. Adhesive or cohesive sealant failures.
    - e. Water leakage through fixed glazing and framing areas.
    - f. Failure of operating components.
  - 2. Warranty Period, Framing: 12 years from date of Substantial Completion.
  - 3. Warranty Period, Glass: 12 years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials, fabrication, or installation within specified warranty period. Warranty does not include normal weathering.
  - 1. Warranty Period: 20 years from date of Substantial Completion.
- C. Special Installer's Warranty: Installer's standard form in which installer agrees to repair or replace point-supported structural glass system that fail in materials, fabrication, or installation within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.
- D. Written warranties for glass against nickel sulfide inclusions in lieu of heat soaking will not be accepted.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Recycled Content: Provide products made from the following metals with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than that indicated below:
  - 1. Steel: Average recycled content of steel to be a minimum 60 percent.
- B. VOC Content: Adhesives and sealants applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 35 13.26 - Sustainable Design Requirements.
  - 1. Use materials that have the minimum VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. General: Provide point supported structural glass systems, including anchorage, capable of withstanding, without failure, the effects of the following:
  - 1. Structural loads.
  - 2. Thermal movements.
  - 3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  - 4. Dimensional tolerances of building frame and other adjacent construction.
  - 5. Failure includes the following:
    - a. Deflection exceeding specified limits.
    - b. Thermal stresses transferred to building structure.
    - c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
    - d. Noise or vibration created by wind and thermal and structural movements.
    - e. Loosening or weakening of fasteners, attachments, and other components.
    - f. Sealant failure.
- D. Delegated Design: Design point supported structural glass systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- E. Performance: Comply with performance requirements specified, as determined by testing of manufacturer's standard point supported structural glass systems representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
  - 1. Point supported structural glass systems shall withstand movements of supporting structure indicated on Drawings including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  - 2. Failure also includes the following:
    - a. Thermal stresses transferring to building structure.
    - b. Glass breakage.
    - c. Noise or vibration created by wind and thermal and structural movements.
    - d. Loosening or weakening of fasteners, attachments, and other components.

- e. Failure of operating units.
- 3. Structural Loads:
  - a. Wind Loads:
    - 1) Basic Wind Speed: As indicated on Structural Drawings
    - 2) Importance Factor: As indicated on Structural Drawings.
    - 3) Exposure Category: As indicated on Structural Drawings
- 4. Structural-Test Performance: Test according to ASTM E330 as follows:
  - a. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
  - b. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
  - c. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- 5. Deflection of Framing Members: At design wind pressure, as follows:
  - a. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding  $L/175$  of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.
  - b. Deflection Parallel to Glazing Plane: Limited to  $L/360$  of clear span or 1/8 inch (3.2 mm), whichever is smaller.
  - c. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.
- 6. Cantilever Deflection: Where framing members overhang an anchor point, limit deflection to two times the length of cantilevered member, divided by 175.
- 7. Seismic Performance: Point supported structural glass systems shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
  - a. Component Importance Factor is indicated on Structural Drawings.
- 8. Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E331 at a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
  - a. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters that is drained to exterior.
- 9. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:
  - a. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
  - b. Test Interior Ambient-Air Temperature: 75 deg F (24 deg C).
- 10. Energy Performance: Point supported structural glass systems shall have certified and labeled energy performance ratings in accordance with NFRC.
- 11. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.30 cfm/sq. ft. (1.50 L/s per sq. m) of fixed wall area as determined according to ASTM E283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).



F. Glass:

1. Average rollerwave distortion is a key element of this specification. Distortion must be certified not to exceed 0.05 mm.
2. All glass must be horizontally tempered eliminating tong marks.
3. All edges will be ground flat with a frosted appearance unless otherwise noted.
4. All edgework, holes and notches in the tempered glass panels will be completed before tempering and shall comply with the following requirements:
  - a. Dimensional tolerance on panel size will be 1 mm of the theoretical dimension required.
  - b. Squareness of each panel will be within 3 mm.
  - c. Bow allowance is 0.1%.
  - d. The positional tolerances on all holes will be 1 mm from a single datum point.
5. Prestress glass around holes to a level which is compatible with the design and use of the fittings. Check stress levels by the use of a differential surface refractometer.
6. Shading Coefficient: 75 percent.

G. Structural-Sealant Joints:

1. Designed to carry gravity loads of glazing.
2. Designed to produce tensile or shear stress of less than 20 psi (138 kPa).

H. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed curtain walls without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.

1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

2.2 MANUFACTURERS AND PRODUCTS

- A. Acceptable Products: Pilkington Planar; 905J point-supported structural glass fittings.

2.3 MATERIALS

A. Glass: Planar SentryGlas Plus System.

1. Color: Clear Low-E.
2. Face glass will be 20 mm clear laminated, made up of a 10mm, 12 mm, 15 mm clear tempered and heat soaked outer lite, 2 mm CIP resin interlayer and a 6 mm clear heat strengthened inner lite. (PVB LAMINATE INTER-LAYERS ARE NOT ALLOWED).
3. Statistical heat soaking will not be acceptable. The heat soak destructive test is to convert nickel sulfide inclusions from the alpha phase to the beta phase so that the glass will fracture in the test. Manufacturer must show by statistical analysis of test data that the probability of failure is not greater than 1 in 54,000 sq. ft. of tempered glass.

- B. Stainless Steel:
  - 1. Tubing: ASTM A554, Grade MT 316L.
  - 2. Pipe: ASTM A312/A312M, Grade TP 316L.
  - 3. Sheet, Strip, Plate, and Flat Bar: ASTM A666, Type 316L.
  - 4. Bars and Shapes: ASTM A276, Type 316L.
- C. Cut Metal Panels:
  - 1. Thickness: As shown on Drawings
  - 2. Alloy and Temper: 6061, T6
  - 3. Size: As shown on the Drawings
  - 4. Finish: Primed and painted using Tnemec, Series 1070V Fluoronar, Advanced Thermoset Solution Fluoropolymer
  - 5. Color(s): As selected by the Architect in coordination with the County Project Manager
  - 6. Layout: As indicated on the Drawings and in accordance with Document 00 73 73.01.

## 2.4 MANUFACTURED UNITS

- A. Unitized System: Shop fabricated units of Basic System including unitized frame, integrally glazed. Fabricate and seal framed units to meet specified performance requirements.
- B. Fittings:
  - 1. Countersunk fittings shall be predominantly manufactured from stainless steel Grade 316. Type of fitting will be the Pilkington PLANAR 905 OR 902 type.
  - 2. The subcontractor shall demonstrate to the Architect's satisfaction that the stresses induced in the glass by these fittings are compatible with the strength of the glass and the needs of the performance section of this specification.
  - 3. The finish of all fittings will be "as machined".
  - 4. Spring plates shall provide a tolerance capability which will cope with the full range of movements shown below:
  - 5. Countersunk bolts will be bright machine finished, socket head bolt diameter 1-1/8" with hexagonal shank, stainless steel Type 303.
    - a. No exterior plates, caps, disks or buttons will be permitted.
  - 6. Bushings will be Nylatron Polyamide, clear in color.
  - 7. Gaskets will be fully vulcanized fiber, neoprene or precured silicone

## 2.5 ACCESSORIES

- A. Anchorage Devices: Manufacturer's standard formed or fabricated steel assemblies of shapes, plates, bars or tubes.
  - 1. Hot-dip galvanize steel assemblies after fabrication according to ASTM A123; provide minimum 0.05 kg (2.0 ounce) coating.
- B. Gaskets: Fiber gaskets as standard with manufacturer.
- C. Fasteners: Non-magnetic stainless steel or other non-corrosive materials compatible with items being fastened.

1. Provide concealed fasteners wherever possible.
  2. Exposed Locations: Phillips flathead screws with finish matching item fastened; set fully flush with unit being fastened.
  3. Concealed Locations: Manufacturer's standard fasteners.
- D. Expansion Anchor Devices: Lead-shield or toothed-steel, drilled-in, expansion bolt anchors.
- E. Sealant: Silicone sealant meeting test requirements of AAMA 802.3, Type 1 and Type II, AAMA 805.2 Group C, AAMA 808.3, and ASTM C920, Type S, Grade NS, Class 25.
1. Primer: As required by sealant manufacturer for applications shown.
  2. Acceptable Products and Manufacturers:
    - a. Dow Corning 1199.
    - b. Schnee Morehead Poly-Glaze Plus SM5731.
    - c. General Electric, Silglaze SCS 2801.
    - d. Color: Clear.

## 2.6 FABRICATION

- A. Coordination of Fabrication: Check actual frame or door openings required in construction work by accurate field measurements before fabrication.
1. Fabricate units to withstand loads that will be applied when system is in place.
- B. General: Provide each unit of framework continuous.
1. Disassemble only to extent necessary for shipment and installation.
  2. Conceal fasteners wherever possible.
  3. Form gutter and weep system to prevent water infiltration.
  4. Separate dissimilar metals in contact with concrete utilizing protective coating or preformed separators which will prevent contact and corrosion.
- C. Welding: Comply with recommendations of American Welding Society (AWS).
1. Use recommended electrodes and methods to avoid distortion and discoloration.
  2. Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.

## 2.7 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Unless otherwise indicated, grind and polish surfaces to produce uniform finish indicated, free of cross scratches.
1. Run grain of directionally textured finishes with long dimension of each piece.
- C. Directional Satin Finish: No. 4 finish.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
  - 1. Comply with manufacturer's written instructions and approved shop drawings.
  - 2. Do not install damaged components.
  - 3. Employ only experienced glaziers who have had previous experience with the materials and systems being applied. Use tools and equipment recommended by the glass manufacturer.
  - 4. Fit joints between components to produce hairline joints free of burrs and distortion.
  - 5. Rigidly secure nonmovement joints.
  - 6. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
  - 7. Seal joints watertight, unless otherwise indicated.
- B. Install units plumb, level, square, and free from warp or twist while maintaining dimensional tolerances and alignment with adjacent surfaces.
- C. Plate to plate joints of glass are sealed with silicone sealant. Joint dimensions shall be designed to be compatible with sealant properties and live load movement of the structure.
- D. Bolt Torque: Torque bolts to torques specified on shop drawings using calibrated tool. Lock torqued bolts into position to prevent backoff. Reset calibrations regularly to ensure accurate torquing.
- E. Maintain a minimum temperature of 40 degrees F. during glazing unless the manufacturer of the glazing material specifically agrees to application of this material at lower temperature. If job progresses or other conditions require glazing work when temperature is below 40 degrees F. (or below the minimum temperature recommended by the manufacturer), consult the manufacturer and establish the minimum provisions required to ensure satisfactory work.
- F. Clean glazing connectors receiving glazing materials of deleterious substances which might impair the work. Remove protective coatings which might fail in adhesion or interfere with bond of sealants. Comply with manufacturer's instructions for final wiping of surfaces immediately before application of primer and glazing sealants. Wipe metal surfaces with xylol or toluol.
- G. Inspect each unit of glass immediately before installation. Glass which has significant impact damage at edges, scratches or abrasion of faces, or any other evidence of damage shall not be installed.

- H. Sealants: Prime surfaces to receive glazing sealants where required, in accordance with manufacturer's recommendations, using recommended primers.
- I. Locate setting blocks, if required by the drawings, at the quarter points of sill, but no closer than 6 inches to corners of glass. Use blocks of proper sizes to support the glass in accordance with manufacturer's recommendations.
- J. Provide spacers to separate glass from spring plates.
- K. Set glass in a manner which produces greatest possible degree of uniformity in appearance. Face all glass, which has dissimilar faces, with matching faces in the same direction.
- L. Use masking tape or other suitable protection to limit coverage of glazing materials to the surfaces intended for sealants.
- M. Tool exposed surfaces of glazing materials.
- N. Clean excess sealant from glass and support members immediately after application, using solvents or cleaners recommended by manufacturers.
- O. Erect framing, vinyl spacer, and glass in accordance with manufacturer's written installation instructions. Seal glass units continuously on both sides of glass between frame and glass and between linear glass units.
- P. Joint Sealant: Install perimeter joint sealant and backing materials between assemblies and adjacent construction.
  - 1. Cure sealants in accordance with the manufacturer's instructions to attain maximum durability and adhesion to glass.
- Q. Erection Tolerances:
  - 1. Limit Variations from Plumb and Level:
    - a. 1/8 inch in 10 feet (3 mm in 3000 mm) vertically.
    - b. 1/8 inch in 20 feet (3 mm in 6000 mm) horizontally.
  - 2. Limit Variations from Theoretical Locations: 1/4 inch (6 mm) for any member at any location.
  - 3. Limit Offsets in Theoretical End-To-End and Edge-To-Edge Alignment: 1/16 inch (1.6 mm) from flush surfaces not more than 2 inches (50 mm) apart or out-of-flush by more than 1/4 inch (6 mm).

### 3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services:
  - 1. Notify manufacturer in timely manner to arrange for manufacturer's field engineer's site visits to ensure proper installation, verify work is in accordance with manufacturer's requirements, and that warranty requirements have been met.
  - 2. Manufacturer's Field Engineer: Monitor activities and advise applicator of proper installation procedures and precautions.
  - 3. Minimum Site Visits:
    - a. Pre-construction conference.

- b. First day of work on site including acceptance of substrate conditions.
  - c. Periodic Visits: Twice during course of installation.
  - d. Inspection of completed work.
- 4. Submit reports; include site observations, instructions, and monitoring activities.
- B. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

**3.4 CLEANING**

- A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 74 19 Construction Waste Management and Disposal. Submit documentation for Credit MR 2 to satisfy the requirements of that Section.
- B. Clean as recommended by manufacturer.
- C. Do not use materials or methods that may damage finish or surrounding construction.

**3.5 PROTECTION**

- A. Protect finished surfaces from damage in accordance with manufacturer's written recommendations for duration of construction period.

END OF SECTION 05 70 00

SECTION 06 13 21 – SITE CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. This section includes:
  - 1. Wood fence.
  - 2. Wood soundwall.
  - 3. Play house.
  - 4. Stump and Log Seating

1.3 RELATED SECTIONS

- A. Section 06 10 00 – Cast in Place Concrete, for footings, landscape walls, and curbs.

1.4 DEFINITIONS

- A. Inspection agencies, and the abbreviations used to reference them, include the following:
  - 1. NHLA - National Hardwood Lumber Association.
  - 2. NLGA - National Lumber Grades Authority.
  - 3. RIS - Redwood Inspection Service.
  - 4. WCLIB - West Coast Lumber Inspection Bureau.
  - 5. WWPA - Western Wood Products Association.
- B. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN INSTITUTE OF TIMBER CONSTRUCTION (AITC)  
AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)  
AITC-0 (1985; 3rd Ed) Timber Construction Manual  
AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)  
AMERICAN PLYWOOD ASSOCIATION: Grades and Standards (APA)  
AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)  
ASTM A 307 (1991) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength  
AMERICAN WOOD PRESERVERS' ASSOCIATION (AWPA)  
AWPA C20 (1991) Structural Lumber - Fire-Retardant Treatment by Pressure Processes  
AWPA M4 (1991) The Care of Preservative-Treated Wood Products  
AMERICAN WOOD PRESERVERS BUREAU (AWPB)

AWPB LP 2 (1988) Softwood Lumber, Timber and Plywood Pressure Treated with Waterborne Preservatives for Above Ground Use  
AWPB LP 22 (1988) Softwood Lumber, Timber and Plywood Pressure Treated With Waterborne Preservative for Ground Contact Use  
NATIONAL FOREST PRODUCTS ASSOCIATION (NFPA)  
NFPA-01 (1991) Suppl.; Errata/Addenda Mar 1992 and Jul 1992) National Design Specification for Wood Construction  
NFPA-02 (1988) Manual for Wood Frame Construction  
NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA)  
NHLA-01 (Jan 1990) Rules for the Measurement & Inspection of Hardwood & Cypress Lumber  
WEST COAST LUMBER INSPECTION BUREAU (WCLIB)  
WCLIB Std 17 (1991) Standard Grading Rules for West Coast Lumber  
WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)  
WESTERN RED CEDAR LUMBER ASSOCIATIONS (WRCLA)  
WWPA-01 (1991) Western Lumber Grading Rules

**1.5 QUALITY ASSURANCE**

- A. Lumber Grading Agency: Certified by WWPA, WCLIB, WRCLA

**1.6 SUBMITTALS**

- A. Shop Drawings: Provide shop drawings for all shop and field fabrications.
- B. Samples:
1. Submit two samples 12 inches long in size illustrating wood grain and finish.
  2. Submit two samples of cedar shingles.
- C. LEED Submittals: See Section 01 35 13.20 for additional requirements; provide the following:
1. Product Data for Credit MR 5: For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
  2. Certificates for Credit MR7: Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
    - a. Include statement indicating costs for each certified wood product.
  3. Product Data for Credit EQ 4.1: For installation adhesives, including printed statement of VOC content and chemical composition of each product used.
  4. Product Data for Credit EQ 4.4:
    - a. For each composite-wood product used, documentation indicating that the bonding agent contains no urea formaldehyde.
    - b. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.



- D. CALGreen Submittals: Provide product data the following:
  - 1. Product Data for CALGreen 5.504.4.1 – Finish Material Pollutant Control; Adhesives, Sealants, and Caulks: For adhesives, sealants, and caulks, including printed statement of VOC content and chemical components.
  - 2. Product Data for CALGreen 5.504.4.5 – Composite Wood Products: For composite-wood products, showing requirements for formaldehyde as specified in Table 5.504.4.
- E. Woodwork Quality Standard Compliance Certificates: WI-certified compliance certificates.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation within and around stacks and under temporary coverings.
- B. Deliver products to site under provisions of these specifications.
- C. Store and protect products under provisions of these specifications.
- D. Stain shall be stored in accordance with the manufacturer's written directions with sufficient ventilation to prevent the buildup of flammable vapors and at temperatures between 40 and 95 degrees F.

#### 1.8 SHORING AND BRACING

- A. Shoring and bracing of the structures may be necessary during the construction of this project. Shoring and bracing of the soil and structures shall be installed where necessary to adequately support the imposed vertical and lateral loads. The Contractor shall be responsible for all means, methods, techniques and sequences of construction. The Contractor shall also be solely responsible for all safety programs and procedures during construction.

### PART 2 - PRODUCTS

#### 2.1 LUMBER, GENERAL

- A. Lumber: Comply with DOC PS 20 and with applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by ALSC's Board of Review. Provide lumber graded by an agency certified by ALSC's Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Factory mark each item with grade stamp of grading agency.
  - 2. For items that are exposed to view in the completed Work, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
  - 3. **Provide dressed lumber, S4S, unless otherwise indicated.**

4. See drawings for design values and wood grading.

- B. Nominal sizes are indicated on drawings, unless otherwise shown by detail dimensions. If discrepancies are found between drawings and specifications, the more stringent requirement applies.

## 2.2 DIMENSION LUMBER

A. Maximum Moisture Content: 19 percent.

- B. **[Addendum 4] Dimension Lumber Frame for Play Houses, Playhouse Furnishings, Wood posts and rails for Wood and Wire Mesh Soundwall, No. 2 and better grade of the following species:**

1. WRCLA Western Red Cedar.

- C. **[Addendum 4] Lumber for Wood Fence, No. 2 and better grade of the following species:**

1. **Construction Heart Redwood.**

## 2.3 BOARDS

A. Maximum Moisture Content: 19 percent.

- B. **[Addendum 4] Boards for Playhouse Furnishings, No. 2 and better grade of the following species:**

1. **WRCLA Western Red Cedar**

## 2.4 TIMBER

A. Maximum Moisture Content: 19 percent.

B. Dressing: Provide dressed timber (S4S) unless otherwise indicated.

C. Timber Posts: Douglas fir-larch, Douglas fir-larch (North), **[No. 1]**, NeLMA, NLGA, WCLIB, or WWPA.

## 2.5 PRESERVATIVE TREATMENT

A. Pressure treat timber with waterborne preservative according to AWPAC15 requirements for "sawn building poles and posts as structural members."

1. Preservative shall be Preserve Plus (ACQ preservative with water repellent) as manufactured by Chemical Specialties, Inc., 2000 East Woodlawn Road, Suite 250, Charlotte, NC 28217, 800/421-8661.
2. The use of arsenic is prohibited.

3. Treated lumber standard: AWPAC2.
4. Preservative treatment standard: ACQ-94.
5. Mark treated wood with treatment quality mark of an inspection agency approved by ALSC's Board of Review.
6. Application:
  - a. Framing members less than 18 inches above grade.
  - b. Sills and ledgers.
  - c. Members in contact with masonry or concrete.
  - d. Posts.

**B. [Addendum 4] Peeled Log Wood Elements: Treat all peeled log wood elements with Timber Pro UV Internal Wood Stabilizer per manufacturer's specifications. Product can only be applied to raw, bare, untreated wood. Do not apply to Nurse Log. Allow treated wood to dry and set up for at least three (3) days before exposing to water and the elements.**

1. **Timber Pro UV (USA)**  
2232 E. Burnside Avenue  
Portland, OR 97214  
<http://timberprocoatings.com/>  
(503) 232-1705
2. **Preparation:**
  - a. Clean wood before treating.
  - b. If mill glazed, sand off glaze.
3. **Tools:**
  - a. Product is very sensitive to chemicals. Clean tools before applying product.
  - b. Use pump sprayer, deck sprayer, or paint brush to apply product.

2.6 ACCESSORIES

- A. Fasteners for Exterior Finish Carpentry: Stainless steel, non-corrosive aluminum or hot-dip galvanized box or casing nails at exterior locations. Provide pre-finished nails in color to match where face nailing is unavoidable.
  1. Where galvanized finish is indicated, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A153/A153M.
- B. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
  1. Use stainless steel unless otherwise indicated.
  2. For pressure-preservative-treated wood, use stainless-steel fasteners.
- C. Post-installed Anchors: Stainless-steel, chemical or torque-controlled expansion anchors with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Stainless-steel bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.
- D. Anchors, Nails, and Screws: Select the material, type, size and finish required by each substrate for secure anchorage; provide toothed steel or lead expansion bolt screws for drilled-in-place anchors.

## **2.7 METAL FRAMING ANCHORS AND HANGERS**

- A. Basis-of-Design Products: Subject to compliance with requirements, provide Simpson Strong-Tie, San Leandro, Ca., and shall be installed with the number and size of nails and/or bolts specified in Simpson catalog #C-98
- B. Comparable products may be provided by one of the following:
  1. Cleveland Steel Specialty Co.
  2. Harlen Metal Products, Inc.
  3. KC Metals Products, Inc.
  4. Southeastern Metals Manufacturing Co., Inc.
  5. USP Structural Connectors.
- C. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- D. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653, G60 coating designation.
- E. Stainless-Steel Sheet: ASTM A 666, Type 304.
- F. To avoid splitting, wood may be pre-bored with lead holes not greater than three-quarters of the fastener diameter. Unless otherwise noted on the plans, the nailing schedule for general framing shall be determined by Table 23-I-Q of the 1994 UBC
- G. All bolts, including threaded rods, machine bolts and anchor bolts, shall conform to ASTM A307, unless otherwise noted on the drawings. Where nuts or bolts bear on wood, malleable iron or cut steel washers shall be placed between the wood and the nut or bolt. The diameter of all bolt holes in wood shall not exceed the bolt diameter by more than 1/16 inch.
- H. Lag screws may never be substituted for thru-bolts, and shall only be used where specifically called out in the structural drawings. All lag screws shall be torqued into position, and never hammer-driven. Lubricate threads with soap to facilitate installation and prevent over-torquing. Lag screws require lead holes. Lead holes for lag screws shall be 2/3 to 3/4 of shank diameter for the threaded portion, and full diameter for the shank.

- I. All screws, nails, bolts, washers, lag screws, and sheet metal connectors shall be stainless steel or hot-dipped galvanized to resist rust. Any other rust-proofing techniques require prior approval of the Structural Engineer.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 PREPARATION**

- A. Clean substrates of projections and substances detrimental to application.
- B. Condition finish carpentry to average prevailing humidity conditions in installation areas before installation for a minimum of 24 hours.

#### **3.3 INSTALLATION**

- A. Set exterior rough carpentry to required levels and lines, with members plumb, level, true to line, cut, and fitted. Fit exterior rough carpentry to other construction; scribe and cope as needed for accurate fit.
- B. Nailing shall be in accordance with the recommended Nailing Schedule as contained in NFPA-02. Use only screw or bolt fasteners where exposed or accessible to children. Where detailed size requirements are not specified, the nail or screw size and spacing shall be sufficient to develop an adequate strength for the connection without splitting the members.
- C. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction" unless otherwise indicated.
- D. Secure decking to framing with stainless steel decking screws as detailed.
- E. Install metal framing anchors to comply with manufacturer's written instructions.
- F. Do not splice structural members between supports unless otherwise indicated.
- G. Place horizontal member laid flat, crown side up.
- H. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- I. Securely attach exterior carpentry work to substrate or concrete wall by anchoring and fastening as indicated, complying with the following:
  1. NES NER-272 for power-driven fasteners.

2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
3. Table 2305.2, "Fastening Schedule," in BOCA's BOCA National Building Code

**3.4 ADJUSTING**

- A. Replace carpentry that is damaged or does not comply with requirements. Carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

**3.5 CLEANING**

- A. Clean all installed items of pencil or ink marks.
- B. Clear the work area of debris.
- C. Leave area of work broom clean.

**3.6 PROTECTION**

- A. Protect installed products from damage from weather and other causes during remainder of the construction period.
- B. Remove and replace carpentry materials that are wet, moisture damaged, and mold damaged.
  1. Indications that materials are wet or moisture-damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 13 21

SECTION 06 20 00 - FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Exterior and interior standing and running trim.
- B. Exterior trellises.
- C. Interior built-in benches.
- D. Interior T&G paneling.

1.3 RELATED SECTIONS

- A. Section 06 10 00 –Rough Carpentry: Wood blocking, furring, sleepers, cants, nailers, and plywood backer boards; wood treatments.
- B. Section 06 16 00 – Sheathing: Wall and roof sheathing.
- C. Section 06 41 00 – Architectural Woodwork: Wood casework.
- D. Section 07 46 28 - Wood Tongue and Groove Siding.

1.4 LEED REQUIREMENTS

- A. Refer to Section 01 35 13.20 for LEED requirements related to this Section.

1.5 DEFINITIONS

- A. Inspection agencies, and the abbreviations used to reference them, include the following:
  - 1. NHLA - National Hardwood Lumber Association.
  - 2. NLGA - National Lumber Grades Authority.
  - 3. RIS - Redwood Inspection Service.
  - 4. WCLIB - West Coast Lumber Inspection Bureau.
  - 5. WWPA - Western Wood Products Association.

1.6 ACTION SUBMITTALS

- A. Product Data: Submit data and samples for each type of finish required.

- B. Shop Drawings: Submit for each item of architectural woodwork. Indicate dimensions, details of construction, method of connection to adjacent construction, finishes, accessories, and hardware.
  - C. Samples: Submit the following:
    - 1. For each species and cut of lumber and panel products with non-factory-applied finish, with 1/2 of exposed surface finished, 50 sq. in. (300 sq. cm) for lumber and 8 by 10 inches (200 by 250 mm) for panels.
    - 2. For each finish system and color of lumber and panel products with factory-applied finish, 50 sq. in. (300 sq. cm) for lumber and 8 by 10 inches (200 by 250 mm) for panels.
    - 3. Four samples of each cut and species of wood to be used, minimum size of 6" x 12".
    - 4. Four additional samples of what will be used by painting trade for staining samples.
  - D. LEED Submittals: See Section 01 35 13.20 for additional requirements; provide the following:
    - 1. Product Data for Credit MR 5: For each material, including its source, cost, and the fraction by weight that is considered regional and that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
    - 2. Certificates for Credit MR7: Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
      - a. Include statement indicating costs for each certified wood product.
    - 3. Product Data for Credit EQ 4.1: For installation adhesives, including printed statement of VOC content and chemical composition of each product used.
    - 4. Product Data for Credit EQ 4.4:
      - a. For each composite-wood product used, documentation indicating that the bonding agent contains no urea formaldehyde.
      - b. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.
  - E. CALGreen Submittals: Provide product data the following:
    - 1. Product Data for CALGreen 5.504.4.1 – Finish Material Pollutant Control; Adhesives, Sealants, and Caulks: For adhesives, sealants, and caulks, including printed statement of VOC content and chemical components.
    - 2. Product Data for CALGreen 5.504.4.5 – Composite Wood Products: For composite-wood products, showing requirements for formaldehyde as specified in Table 5.504.4.
  - F. Woodwork Quality Standard Compliance Certificates: WI-certified compliance certificates.
- 1.7 QUALITY ASSURANCE
- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate interior carpentry items similar to that indicated for this Project and whose products have a record of successful in-service performance.
  - B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.



- C. Forest Certification: Provide components made with not less than 50 percent of wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- D. NAAWS Quality Standard: Comply with the specified grade(s) of interior architectural woodwork indicated for construction, finishes, and installation, specified section(s), and applicable requirements of the current edition of the "North American Architectural Woodwork Standards – 3.0, United States Version".
  - 1. Provide WI-certified compliance labels and certificates indicating that woodwork, including installation, complies with requirements of grades specified.

**1.8 DELIVERY, STORAGE, AND HANDLING**

- A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation within and around stacks and under temporary coverings.
- B. Deliver interior finish carpentry materials only when environmental conditions meet requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

**1.9 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
  - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

**PART 2 - PRODUCTS**

**2.1 LEED MATERIAL REQUIREMENTS, GENERAL**

- A. Forest Certification: Provide components made with not less than 50 percent of wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- B. Certified Wood: Use wood based products made from wood obtained from forests certified by an FSC accredited certification body to comply with the Forest Stewardship Councils "Principles and Criteria."
- C. Adhesives: Water-resistant type recommended by material manufacturer for products and substrate conditions indicated.

1. Use materials that have the minimum VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

- D. Composite Wood and Agrifiber: Use only composite wood and agrifiber products free of added urea formaldehyde resin binders.

## 2.2 MATERIALS

- A. Lumber Standards: Comply with PS 20 "American Softwood Lumber Standard" for lumber and with applicable grading rules of inspection agencies.
- B. MDF: ANSI A208.2, Grade 130, made with binder containing no urea-formaldehyde resin.
- C. Wood Moisture Content: Comply with requirements of referenced quality standard and manufacturer's recommendations for moisture content of finish carpentry.

## 2.3 EXTERIOR STANDING AND RUNNING TRIM

- A. Lumber Trim for Clear-Finished Exterior Applications: Kiln-dried lumber with surfaced (smooth) face and of the following species and grade:
  1. Clear Heart Grade A western red cedar; NLGA, WCLIB, or WWPA.
  2. Maximum Moisture Content: 15 percent.
- B. Lumber Trim for Opaque-Stained Painted Applications: Kiln-dried, solid lumber with surfaced (smooth) face and of one of the following species and grade:
  1. Clear Grade B redwood; RIS.
  2. Grade B western red cedar; NLGA, WCLIB, or WWPA.
  3. Grade Prime or D finish /1 Common /2 Common hem-fir; NLGA, WCLIB, or WWPA.

## 2.4 INTERIOR STANDING AND RUNNING TRIM

- A. Lumber Trim for Clear-Finished Interior Applications: Kiln-dried lumber with surfaced (smooth) face and of the following species and grade:
  1. Species: Western Red Cedar
  2. Grade: Grade A
  3. Maximum Moisture Content: 12 percent.
- B. Lumber Trim for Opaque Finish (Painted): Finished lumber (S4S), either finger-jointed or solid lumber, of one of the following species and grades:
  1. Grade D Select (Quality) /1 Common (Colonial) 2 Common (Sterling) Idaho white, lodgepole, ponderosa, or sugar pine; NLGA or WWPA.
  2. Grade D Select /1 Common /2 Common white woods; WWPA.
  3. Grade Superior or C & Btr finish /Prime or D finish, Douglas fir-larch or Douglas fir south; NLGA, WCLIB, or WWPA.

## 2.5 BENCH CONSTRUCTION

- A. Construction:
  1. Quality Standard: Comply with NAAWS Section 6.

2. NAAWS Grade: Custom.
3. Material: Clear finished wood; Western Red Cedar
4. Type II adhesive.
5. Single length sections.
6. Intermediate support for spans over 48 inches to prevent deflection in excess of 1/4 inch under a 50 pound per sq ft load.
7. Edge Treatment: As indicated on Drawings.
8. Joints: Well fit and flush.
9. Support Brackets: Steel, painted, as indicated on Drawings.

**2.6 INTERIOR T&G PANELING**

- A. Quality Standard: Comply with NAAWS Section 8.
  1. NAAWS Grade: Custom.
- B. Wood Species and Cut: T&G western red cedar, clear vertical grain
  1. Pattern: Vee joint, tongue and groove.
  2. Dimensions: As indicated on Drawings.
- C. Shop fabricate board paneling in lengths to provide pieces that are uninterrupted by joints. Machine edges of boards to provide joint profiles indicated.
- D. Preassemble board paneling into largest units that can be delivered into installation areas using permanent or temporary backing members as indicated. To maximum extent possible, fabricate units in sizes determined by field measurements of existing conditions and that will avoid fitting in the field; make provision for separate scribing pieces to be fitted to adjoining finished surfaces. Provide shop-prepared detachable pieces for forming joints with other units at Project site and with other types of architectural woodwork.

**2.7 ACCESSORIES**

- A. Fasteners for Exterior Finish Carpentry: Stainless steel, non-corrosive aluminum or hot-dip galvanized box or casing nails at exterior locations. Provide pre-finished nails in color to match where face nailing is unavoidable.
  1. Where galvanized finish is indicated, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A153/A153M.
- B. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
  1. Where galvanized finish is indicated, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A153/A153M.
- C. Anchors, Nails, and Screws: Select the material, type, size and finish required by each substrate for secure anchorage; provide toothed steel or lead expansion bolt screws for drilled-in-place anchors.
- D. Wood Putty: Standard industry grade for use in plugging fastener holes where required on Drawings, of color to match wood stain or finish; paintable where applicable.

- E. Glue: Aliphatic- or phenolic-resin wood glue recommended by manufacturer for general carpentry use.
  - 1. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    - a. Wood Glues: 30 g/L.
    - b. Contact Adhesive: 250 g/L.

## 2.8 SHOP FINISHING

- A. Finish carpentry items at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
  - 1. Prime, stain, or seal wood. Prime edges, ends, faces, undersides, and backsides of all wood surfaces.
    - a. Opaque Finish: Backprime with same finish material.
    - b. Exterior Stained Wood: Backprime with spar varnish.
- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing paneling, as applicable to each unit of work.
- C. Prime woodwork for opaque finish with one coat of wood primer compatible with specified topcoats.
- D. Exterior Transparent Finish: Stain, as selected by Architect.
- E. Exterior Opaque Finish: Paint, as selected by Architect.
- F. Interior Transparent Finish:
  - 1. Grade: Custom.
  - 2. ~~NAAWS Finish System 3: Score 124-T, lacquer pre-catalyzed.~~
  - 2. **[Addendum 4] NAAWS Finish System 12: Score 112-T, Polyurethane, water based.**
  - 3. Staining: Match approved sample for color.
  - 4. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D523.
- G. Interior Opaque Finish:
  - 1. Grade: Custom.
  - 2. NAAWS Finish System 9: Score 133-O, UV curable, acrylated epoxy, polyester or urethane.
  - 3. Color: To be selected.
  - 4. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D523.
- H. Paneling: As indicated on Drawings.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Condition finish carpentry to average prevailing humidity conditions in installation areas before installation for a minimum of 24 hours.

#### 3.3 INSTALLATION, GENERAL

- A. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
  - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
  - 2. Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.
  - 3. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining interior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
  - 4. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.
- B. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
  - 1. Do not use manufactured units with defective surfaces, sizes, or patterns.

#### 3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.
  - 1. Match color and grain pattern across joints.
  - 2. Install trim after gypsum board joint finishing and plastering operations are completed.
  - 3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.
  - 4. Fit exterior joints to exclude water.

**3.5 BENCH INSTALLATION**

- A. Install woodwork to comply with NAAWS Section 6 for same grade specified in Part 2 of this Section for type of woodwork involved.
- B. Install without distortion so bench fits on wall properly and is accurately aligned.
  - 1. Install benches with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
  - 2. Fasten steel bench supports at spacing indicated on Drawings with fasteners sized for minimum 1-inch (25-mm) penetration into wood framing or blocking.
- C. Use concealed joint fasteners to align and secure adjoining units.
- D. Carefully scribe benches abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

**3.6 PANELING INSTALLATION**

- A. Install paneling with smooth and flush joints to create a homogenous look.
- B. Furr and install paneling of adequate thickness and in such a way as to avoid deflection when normal pressure is applied.
- C. Set grounds plumb and true.
- D. Use concealed fastening to the fullest extent possible. If exposed fastening is required to complete the installation, set fasteners in quirks where possible, countersunk, kept to a minimum and placed in such a manner as to be least visible when the installation is complete.
- E. Pay special attention to color and grain of the various panels and trim pieces to assure they are installed in compliance with the NAAWS Grade specified.
- F. Gluing with liquid nail type adhesive is not permitted.
- G. Apply one coat of sealer to edges of core that are not self-edged before installation.
- H. Panel Joint Tolerances
  - 1. Plumb within 1/16 inch in 96 inches.
  - 2. Warp: Free of warp exceeding 1/32 inch per lineal foot.

**3.7 ADJUSTING**

- A. Replace finish carpentry that is damaged or does not comply with requirements. Finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.8 CLEANING

- A. Construction Waste Management: Manage construction waste in accordance with provisions of Section [ADDENDUM 3] 01 35 13.26 Construction Waste Management. Submit documentation for Credit MR 2 to satisfy the requirements of that Section.
- B. Clean all installed items of pencil or ink marks.
- C. Clean finish carpentry on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.
- D. Clear the work area of debris, using containers provided by the General Contractor.
- E. Leave area of work broom clean.

3.9 PROTECTION

- A. Protect installed products from damage from weather and other causes during remainder of the construction period.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
  - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 20 00

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SECTION 06 41 00 - ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Wall mounted shelving with heavy-duty bracket supports.
- B. Plastic laminate cabinets.
- C. ~~Wood veneer cabinets and casework.~~ [Addendum 4]
- D. [Addendum 4] Wood veneer end panels and canopy tops at library shelving.

1.3 RELATED SECTIONS

- A. Section 06 20 00 – Finish Carpentry: Finished wood carpentry trims and benches.
- B. Section 11 40 00 – Food Service Equipment: Casework for food service.
- C. Section 12 36 61 – Countertops: Quartz-surfacing and plastic laminate countertops.

1.4 LEED REQUIREMENTS

- A. Refer to Section 01 35 13.20 for LEED requirements related to this Section.

1.5 DEFINITIONS

- A. Exposed surfaces include all surfaces visible when:
  - 1. Drawers and opaque doors (if any) are closed.
  - 2. Areas behind clear glass doors.
  - 3. Bottoms of cabinets 42-inches or more above finished floor.
  - 4. Top of cabinets below 78-inches above finished floor.
- B. Semi-exposed surfaces include the following:
  - 1. Open opaque doors or extended drawers.
  - 2. Bottoms of cabinets that are more than 30-inches and less than 42-inches above finished floor.
- C. Concealed surfaces include the following:
  - 1. Surfaces not visible after installation.
  - 2. Bottoms of cabinets less than 30-inches above finished floor.

3. Tops of cabinets over 78-inches above finish floor and not visible from an upper level.
4. Stretchers, blocking, and components concealed by drawers.

#### 1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, including cabinet hardware and accessories and finishing materials and processes.
- B. Shop Drawings: Submit shop drawings for each item of architectural woodwork. Indicate dimensions, details of construction, finishes, and hardware.
  1. Show details full size.
  2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
- C. Samples for Verification:
  1. Veneer-faced panel products with or for transparent finish, ~~12 by 24 inches (300 by 600 mm)~~, [Addendum 4] 12" x 12" for each species and cut. Include at least one face-veneer seam and edge condition, finished as specified.
  2. Plastic laminates, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish, ~~with 1 sample applied to core material and specified edge material applied to 1 edge.~~ [Addendum 4]
  3. ~~Thermoset decorative panels, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish, with edge banding on 1 edge.~~ [Addendum 4]
- D. LEED Submittals: See Section 01 35 13.20 for additional requirements; provide the following:
  1. Certificates for Credit MR 7: Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
    - a. Include statement indicating costs for each certified wood product.
  2. Product Data for Credit IEQ 4.1: For installation adhesives, including printed statement of VOC content and chemical composition of each product used.
  3. Product Data for Credit IEQ 4.2: Product Data Sheets and MSDS for each product to be used as proof that each product meets the requirements of the GREENGUARD Environmental Institute's GREENGUARD certification.
    - a. Include printed statement of VOC content and chemical components.
  4. Product Data for Credit IEQ 4.4:
    - a. For each composite-wood product used, documentation indicating that the bonding agent contains no urea formaldehyde.
    - b. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.
- E. CALGreen Submittals: Provide product data the following:
  1. Product Data for CALGreen 5.504.4.1 – Finish Material Pollutant Control; Adhesives, Sealants, and Caulks: For adhesives, sealants, and caulks, including printed statement of VOC content and chemical components.

2. Product Data for CALGreen 5.504.4.5 – Composite Wood Products: For composite-wood products, showing requirements for formaldehyde as specified in Table 5.504.4.

- F. Woodwork Quality Standard Compliance Certificates: WI-certified compliance certificates.

#### 1.7 QUALITY CONTROL

- A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers.
- B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- C. Forest Certification: Provide components made with not less than 50 percent of wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- D. NAAWS Quality Standard: Comply with the specified grade(s) of interior architectural woodwork indicated for construction, finishes, and installation, specified section(s), and applicable requirements of the current edition of the "North American Architectural Woodwork Standards – 3.0, United States Version".
  1. Provide WI-certified compliance labels and certificates indicating that woodwork, including installation, complies with requirements of grades specified.
  2. Provide Seismic certificates indicating that casework is installed with all required wall blocking and that fastener size, frequency and locations requirements have been met.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

#### 1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Field Measurements: All casework dimensions shall be field verified prior to fabrication.

#### 1.10 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

### PART 2 - PRODUCTS

#### 2.1 LEED MATERIAL REQUIREMENTS, GENERAL

- A. Forest Certification: Provide components made with not less than 50 percent of wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- B. Certified Wood: Use wood based products made from wood obtained from forests certified by an FSC accredited certification body to comply with the Forest Stewardship Councils "Principles and Criteria."
- C. Adhesives: Water-resistant type recommended by material manufacturer for products and substrate conditions indicated.
  1. Use materials that have the minimum VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Composite Wood and Agrifiber: Use only composite wood and agrifiber products free of added urea formaldehyde resin binders.

#### 2.2 MATERIALS

- A. General: Provide materials that comply with requirements of NAAWS's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Veneer Species and Cut for Transparent Finish: White Maple. **[Addendum 4] Stain to match Architects' sample.**
- C. Hardwood and Softwood Lumber: Custom graded in accordance with NAAWS; average moisture content of 8 percent.
  1. Species: Any closed-grain hardwood. For use at concealed areas only.
- D. Hardwood Plywood: ANSI/HPVA HP-1; veneer core material; type of glue recommended for application.
  1. Formaldehyde Emission Levels: No urea formaldehyde.

2. Wood Veneer Species and Cut for Casework: ~~As indicated on Drawings.~~  
**[Addendum 4] Maple, stained to match Architects' sample.**
  3. Face Grade: Grade A.
  4. Thickness: 3/4-inch.
  5. Veneer Core: 5-ply.
  6. Cut: Sliced-vertical grain.
  7. Back Grade: Minimum Grade 2.
- E. MDF: ANSI A208.2, Grade 130, made with binder containing no urea-formaldehyde resin.
1. Acceptable Products: SierraPine's "Medex," "Medex NC," and "Medite II" and Weyerhaeuser's "Premier Plus".
- F. Cabinet Interiors, Shelves, and Counter Substrate: 3/4-inch Medite II, interior grade wood-based composite panels manufactured from softwood fibers with minimum 90% pre-consumer recycled wood combined with formaldehyde-free synthetic resin, with clear sealer.
- G. Plastic Laminate:
1. High-pressure decorative laminate (HPDL) complying with NEMA LD 3.
  2. Plastic Laminate for Exposed Surfaces: HGS for nonpostformed surfaces; HGP for postformed surfaces.
  3. Basis-of-Design Product: The design for the system is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
    - a. Basis-of-Design: As indicated on Drawings.
    - b. Formica Corporation.
    - c. Panolam Industries; Nevamar
    - d. Wilsonart International.
  4. Plastic Laminate Materials: Provide only plastic laminate materials that are GREENGUARD Certified.
    - a. Individual VOC's: <0.1 TLV.
    - b. Total VOC's: <0.5 mg/m<sup>3</sup>
    - c. Formaldehyde: <0.05 ppm
    - d. 4-Pheylcyclohexene: <0.0065 mg/m<sup>3</sup>
    - e. Total Aldehydes: <0.1 ppm
- H. ~~Thermoset Decorative Panels (Melamine): Particleboard or medium density fiberboard finished with thermally fused, melamine impregnated decorative paper complying with LMA SAT-1.~~ **[Addendum 4]**
1. ~~Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semiexposed edges.~~
  2. ~~Color: White, unless indicated otherwise on Drawings.~~
- I. Wall-Hung Countertop Supports: Cold rolled steel supports.
1. Angle Support Brackets: As detailed.
  2. Floating Countertop Support Brackets: As detailed.

- J. Adhesive: FS MMM-A-130 contact adhesive; type recommended by laminate manufacturer to suit application.
  - 1. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    - a. Wood Glues: 30 g/L.
    - b. Contact Adhesive: 250 g/L.
- K. Bolts, Nuts, Washers, Lags, Pins, Fasteners, and Screws: Of size and type to suit application.

## 2.3 CUSTOM CASEWORK FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.
  - 1. Wood Cabinet Construction: NAAWS Section 10, Custom Grade.
  - 2. Reception Desk Construction: NAAWS Section 10, Premium Grade.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- D. Fabricate woodwork to dimensions, profiles, and details indicated.
- E. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- F. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
  - 1. Seal edges of openings in countertops with a coat of varnish.

## 2.4 SHELF FABRICATION

- A. Construction:
  - 1. Quality Standard: Comply with NAAWS Section 10.
  - 2. NAAWS Grade: Custom.
  - 3. Type: Type II single-length sections to fit across openings.
  - 4. Surface: Plastic laminate applied with a rigid glue line.
  - 5. Intermediate support for spans over 48 inches to prevent deflection in excess of ¼ inch under a 50 pound per sq ft load.
  - 6. Core Material: MDF.
  - 7. Edge Material: PVC edge banding as specified.

8. Wall Mounted Shelves: Finish all exposed edges same as primary surfaces.
9. Support System:
  - a. Cabinet Shelves: Bored hole; extend holes vertically within 6-inches of the interior top and bottom of the cabinet body.
  - b. Exposed, Wall-Mounted Shelves: Standards and adjustable shelf brackets as detailed.
10. Seismic Requirements: Use an approved method of shelf restraint on all display shelves. At shelves over 24-inches deep provide 3 supports at each end.

B. Colors, Patterns, and Finishes: As indicated on Drawings.

## 2.5 PLASTIC LAMINATE CABINET CONSTRUCTION

### A. Construction:

1. Quality Standard: Comply with NAAWS Section 10.
2. NAAWS Grade: Custom.
3. Type: Type II single-length sections to fit across openings.
4. Cabinet Style: Style A Frameless.
5. Interface Style: Overlay, Figure 10-057.
6. Door and Drawer Front Style: Flush overlay.
7. Exposed Exterior Surfaces: HPDL as specified.
8. Exposed Interior Surfaces: HPDL matching exposed exterior surfaces.
9. Exposed Interior Surfaces of Door and Drawer Fronts: Covered with the same material, pattern, color and thickness as the door face.
10. Core Material: MDF.
11. Door and Drawer Edge: Square edge with thin applied band.
  - a. Edge Banding: HPDL, minimum 0.02-inch thick, color-matched to the exposed face.
12. Shelf Thickness: As specified in Architectural Woodwork Standards (NAAWS) for a uniform load of 50-lb/sq ft.

### B. Semiexposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
2. Drawer Sides and Backs: Hardwood.
3. Drawer Bottoms: Hardwood.
4. Exposed Edges: Extruded PVC or self-edged plastic laminate

C. Colors, Patterns, and Finishes: As indicated on Drawings.

D. Cabinet Hardware: ANSI/BHMA A156.9, see schedule at end of this Section.

## 2.6 ~~WOOD CABINET~~ [ADDENDUM 4] END PANELS AND SHELVING TOPS CONSTRUCTION

### A. NAAWS Requirements:

1. Quality Standard: Comply with NAAWS Section 10.
2. Grade: Custom.
3. Material: Veneer plywood, White Maple, clear, satin finish as specified.
4. Construction Style: Type A Frameless.

5. Construction Type: Type II single-length sections to fit across openings.
  6. Door and Drawer Front Style: Flush overlay.
    - a. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
    - b. Matching of Veneer Leaves: Slip match.
  - B. Semiexposed Surfaces: Provide surface materials indicated below:
    1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
    2. Drawer Sides and Backs: Hardwood.
    3. Drawer Bottoms: Hardwood.
  - C. Countertop Support: 3/4-inch plywood.
  - D. Edge Material: Same as cladding on faces.
  - E. Cabinet Hardware: ANSI/BHMA A156.9, see schedule at end of this Section.
- 2.7 SHOP FINISHING, WOOD CABINETS [ADDENDUM 4] END PANELS AND CANOPY TOPS
- A. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
  - B. Grade: Provide finishes of same grades as items to be finished.
    1. Finish interior of wood cabinets to match exterior.
  - C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
    1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.
    2. Remove handling marks or effects of exposure to moisture from all exposed portions of woodwork by means of a thorough, final sanding over all surfaces of the exposed portions, using appropriate grit sandpaper and clean before applying sealer or finish.
  - D. Transparent Finish:
    1. Grade: Custom.
    2. ~~NAAWS Finish System 3: Score 124-T, lacquer pre-catalyzed.~~
    2. **[Addendum 4] NAAWS Finish System 12: Score 112-T, Polyurethane, water based.**
    3. Staining: Match approved sample for color.
    4. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D523.



### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Verify the adequacy and proper location of any required backing or support framing.
- C. Verify that mechanical, electrical, plumbing and other building items affecting solid surfacing components are in place, complete and to receive the work of this Section.
- D. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing material and backpriming.

#### 3.2 INSTALLATION, GENERAL

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

#### 3.3 CABINET INSTALLATION

- A. Install woodwork to comply with NAAWS Section 10 for same grade specified in Part 2 of this Section for type of woodwork involved.
- B. Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
  - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
  - 2. Maintain veneer sequence matching of cabinets with transparent finish.

3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) oc with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.
- C. Countertops: Anchor securely to base units.
  1. Align adjacent countertops and form seams handtight to minimize joints using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- D. Use concealed joint fasteners to align and secure adjoining cabinet units.
- E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- F. Secure cabinet bases to floor using appropriate anchorages. Permanently fix countertops to wall using appropriate angles.
- G. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
- H. Clean casework, counters, shelves, hardware, fittings and fixtures.
- I. Upon completion of installation, clean all installed items. Remove pencil and ink marks from surfaces. Leave area of work broom clean.
- J. Install countertops as specified in Section 12 36 61. Protect countertops after installation; do not allow other trades to use countertops as footstools or ladders to perform their work. Cover completed cabinetwork with protective enclosure, applied in a manner to permit easy removal.

#### 3.4 SHELF INSTALLATION

- A. Install woodwork to comply with NAAWS Section 10 for same grade specified in Part 2 of this section for type of woodwork involved.
- B. Interior Casework Shelving: Install adjustable shelving on evenly spaced, shelf pilaster standards and rests.
- C. Exterior Shelving: Install on brackets and standards, spaced as detailed on Drawings.
- D. Install without distortion shelves fit openings properly and are accurately aligned.
  1. Install shelves with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
- E. Use concealed joint fasteners to align and secure adjoining cabinet units.
- F. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

- G. Clean shelves and hardware.
- H. Upon completion of installation, clean all installed items. Remove pencil and ink marks from surfaces. Leave area of work broom clean.

### 3.5 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Construction Waste Management: Manage construction waste in accordance with provisions of Section [ADDENDUM 3] 01 35 13.26 Construction Waste Management and Disposal. Submit documentation for Credit MR 2 to satisfy the requirements of that Section.
- C. Clean, lubricate, and adjust hardware.
- D. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

### 3.6 CABINET HARDWARE SCHEDULE

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Section 08 71 00. Where manufacturer's name or product number is not indicated provide best quality commercially available cabinet hardware.
- B. Wall Shelving Pilaster Standards and Brackets: BHMA A156.9, all components steel.
  - 1. Acceptable Products, Heavy-Duty Pilaster Standards:
    - a. KV 82.
    - b. Sugatsune SP-1820.
    - c. Accepted equivalent.
  - 2. Acceptable Products, Heavy-Duty Brackets:
    - a. KV 182.
    - b. Sugatsune SPB-200
    - c. Accepted equivalent.
- C. Cabinet Shelf Pilaster Standards and Rests: BHMA A156.9, all components steel, B04071; with shelf rests, B04081:
  - 1. Acceptable Products, Heavy-Duty Pilaster Standards:
    - a. KV 255 Series.
    - b. Sugatsune SPE-1820.
    - c. Accepted equivalent.
  - 2. Acceptable Products, Shelf Rests:
    - a. KV 237.
    - b. Sugatsune SPF-20
    - c. Accepted equivalent.

- D. Light Weight Drawer Slides: BHMA A156.9, B05091:
  - 1. Acceptable Products:
    - a. KV 8300.
    - b. Accuride 2132.
    - c. Accepted equivalent.
  - 2. Standard Duty (Grade 1, Grade 2, and Grade 3): Side mounted; zinc-plated steel with polymer rollers.
  - 3. 3/4 extension slides with stops, 75 pound capacity, 12-inch wide x 6-inch deep drawers maximum.
  - 4. Size slides in accordance with manufacturer's recommendations for drawer width.
- E. Heavy Weight Drawer Slides: BHMA A156.9, B05091:
  - 1. Acceptable Products:
    - a. KV 8805.
    - b. Accuride 3640A.
    - c. Accepted equivalent.
  - 2. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-overtravel-extension type; zinc-plated steel ball-bearing slides.
  - 3. Full extension slides with 1-inch overtravel, side-mount,
    - a. General Purpose Drawers: 200 lb capacity.
  - 4. Size slides in accordance with manufacturer's recommendations for drawer width.
- F. Drawer and Door Pulls: As indicated on Drawings.
  - 1. Back-Mounted Pulls: BHMA A156.9, B02011.
  - 2. ~~Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter, and: 1-1/4" (32mm) projection.~~
- G. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 110 degrees of opening, self-closing.
  - 1. Acceptable Products:
    - a. Blum BLUMOTION.
    - b. Hafele.
    - c. Accepted equivalent.
  - 2. Provide three hinges for doors over 48 inches in height.
- H. Cabinet, Sliding Door, and Drawer Locks:
  - 1. Medeco High Security Locks.
  - 2. Door Locks: BHMA A156.11, E07121.
  - 3. Drawer Locks: BHMA A156.11, E07041.
- I. Cash Drawer: APG Cash Drawer Series 100, or accepted equivalent.
  - 1. Adjustable media slot divider.
  - 2. Industrial grade, steel ball bearing slides.
  - 3. Large, configurable under-till storage area to accommodate both coin roll and packaged currency storage.
  - 4. Four function lock.
  - 5. Closed and latched drawer status switch.
  - 6. Color: Black.

- J. Pencil Drawer:
  - 1. Manufacturers: Closet Masters #D2957-300, Toolhawk, "large pencil tray", or equal.
  - 2. Size: 1-1/2" H x 16" W x 20" D.
- K. Drawer Edging:
  - 1. File Folder Support:
    - a. Vertical Files: Hafele, "File Drawer Folder Hanging Rail", #422.71.901, satin silver finish, or equal, no known (metal) equal. Note that the width of the drawer box is very specific to letter size files; fabricate the width of the file drawer units sized to handle files without wasted width.
    - b. Drawer Protection Edge: 18 gage, #304 brushed stainless steel finish.
- L. Grommets for Cable Passage through Countertops: 2-inch (51-mm) OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.
- M. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
  - 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
  - 2. Bright Chromium Plated: BHMA 625 for brass or bronze base; BHMA 651 for steel base.
  - 3. Satin Stainless Steel: BHMA 630.
  - 4. Satin Nickel: BHMA 646 or 670.
- N. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

END OF SECTION 06 41 00

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SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Solid core wood doors, non-rated.

1.3 LEED REQUIREMENTS

- A. Refer to Section 01 35 13.20 for LEED requirements related to this Section.

1.4 RELATED SECTIONS

- A. Section 08 71 00 –Door Hardware: Installation of hardware in wood doors.
- B. Section 08 81 00 – Glass Glazing: Glass for glazed stile and rail doors.
- C. Section 09 91 00 – Painting: Field finishing of wood doors.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings.
  - 1. Include adhesive and composite wood materials manufacturers' product data indicating urea-formaldehyde content.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
  - 1. Indicate dimensions and locations of mortises and holes for hardware.
  - 2. Indicate dimensions and locations of cutouts.
  - 3. Indicate doors to be factory finished and finish requirements.
- C. Samples for Verification: Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

- D. LEED Submittals: See Section 01 35 13.20 for additional requirements; provide the following:
  - 1. Certificates for Credit MR 7: Chain-of-custody certificates certifying that flush wood doors are to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
    - a. Include statement indicating costs for each certified wood product.
  - 2. Product Data for Credit IEQ 4.1: For installation adhesives, including printed statement of VOC content and chemical composition of each product used.
  - 3. Product Data for Credit IEQ 4.4:
    - a. For each composite-wood product used, documentation indicating that the bonding agent contains no added urea formaldehyde.
    - b. For each adhesive used, documentation indicating that the adhesive contains no added urea formaldehyde.
- E. CALGreen Submittals: Provide product data for the following:
  - 1. Product Data for CALGreen 5.504.4.1 – Finish Material Pollutant Control; Adhesives, Sealants, and Caulks: For adhesives, sealants, and caulks, including printed statement of VOC content.
  - 2. Product Data for CALGreen 5.504.4.5 – Composite Wood Products: For composite-wood products, showing requirements for formaldehyde as specified in Table 5.504.4.
- F. Warranty: Sample of special warranty.

#### 1.6 QUALITY STANDARDS

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Comply with NAAWS "Architectural Woodwork Standards" for requirements in the door grades indicated.
- C. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

#### 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and



maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

**1.9 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
    - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.
  - 2. Warranty Period for Solid-Core Interior Doors: Life of the original installation, including costs of re-hanging.

**PART 2 - PRODUCTS**

**2.1 LEED MATERIAL REQUIREMENTS, GENERAL**

- A. Certified Wood: Use wood based products made from wood obtained from forests certified by an FSC accredited certification body to comply with the Forest Stewardship Councils "Principles and Criteria."
- B. Adhesives: Water-resistant type recommended by material manufacturer for products and substrate conditions indicated.
  - 1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Composite Wood and Agrifiber: Use only composite wood and agrifiber products free of added urea formaldehyde resin binders.

**2.2 MANUFACTURERS**

- A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Eggers Industries.
  - 2. Marshfield Door Systems.
  - 3. VT Industries Architectural Wood Doors.

**2.3 MATERIALS**

- A. General Wood Door Product Requirements: Provide doors with same exposed surface material on both faces of each door; meeting requirements of NANAAWS Section 9; unless otherwise indicated.
- B. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

- C. Adhesives: NWWDA IS-1.6, Type II adhesive bond or better for cores, Type I adhesive bond for faces and cross bands. Do not use adhesives containing urea formaldehyde.

## 2.4 INTERIOR DOOR CONSTRUCTION

- A. General Wood Door Product Requirements: Provide doors with same exposed surface material on both faces of each door; meeting requirements of NANAAWS Section 9 unless otherwise indicated.
- B. Interior, Solid-Core, Veneer-Faced Doors:
  - 1. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.
  - 2. Core (Solid, Non-Rated): NANAAWS Section 9, HPVA Grade A, particleboard core.
    - a. Particleboard: ANSI A208.1, Grade LD-1.
    - b. Use particleboard made with binder containing no added urea-formaldehyde resin.
  - 3. Adhesive: Type I or Type II
  - 4. WDMA I.S.1-A Performance Grade:
    - a. Heavy Duty: At office, mechanical service, hallway, storage doors.
    - b. Extra Heavy Duty: At public bathrooms, assembly areas, and kitchens.
  - 5. Blocking: Provide wood blocking in particleboard-core doors as follows:
    - a. 5-inch (125-mm) top-rail blocking, in doors indicated to have closers.
    - b. 5-inch (125-mm) bottom-rail blocking, typical, except where specified otherwise for special conditions.
    - c. 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.
    - d. 10-inch (250-mm) bottom-rail blocking, in doors indicated to have kick, mop, or armor plates.
  - 6. Provide doors with glued-wood-stave cores instead of particleboard cores for doors indicated to receive exit devices.
- C. Veneer-Faced, Interior, Doors for Transparent Finish:
  - 1. NANAAWS Grade: Custom (Grade A faces).
  - 2. Species and Cut: White maple, plain sliced.
  - 3. Match between Veneer Leaves: Book match.
  - 4. Assembly of Veneer Leaves on Door Faces: Running match.
  - 5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
  - 6. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
  - 7. Corridor Match: Corridor door faces do not need to match where they are separated by 20 feet (6 m) or more.
  - 8. Stiles: Same species as faces.
- D. Veneer-Faced, Interior, Doors for Opaque Finish:
  - 1. NAAWS Grade: Custom.
  - 2. Faces for Interior Doors: Any closed-grain hardwood of mill option; factory-primed for paint finish.

2.5 ACCESSORIES

- A. Glazing Stops:
  - 1. Non-rated Areas: Wood, of same species as door facing.

2.6 FABRICATION

- A. Factory-pre-fit and pre-machine doors to fit frame opening sizes indicated and complying with NAAWS pre-fitting tolerances.
- B. Provide lock blocks at lock edge and top of door for closer as required for hardware reinforcement.
- C. Vertical Exposed Edge of Stiles: Hardwood of species compatible in color with veneer facing for transparent finish; hardwood for paint finish.
- D. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware. Provide solid blocking for through bolted hardware.

2.7 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
  - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Transparent Finish: Finish doors at factory.
  - 1. Grade: Custom.
  - 2. NAAWS Finish System 9: Score 133-O, UV curable, acrylated epoxy, polyester or urethane.
  - 3. Color: ~~To be selected.~~ **[Addendum 4] To be selected by Architect from Manufacturer's standard line, or custom stain to match Architect's sample if acceptable standard color is not available.**
  - 4. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D523.
- C. Opaque Finish: See Section 09 91 00.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect openings before installation. Verify that rough openings are correct before proceeding.
- B. Examine doors and substrates, with Installer present, for suitable conditions where wood doors will be installed.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
2. Reject doors with defects.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install wood doors to comply with manufacturer's instructions, in accordance with NAAWS Section 9 requirements.
- B. Align and fit doors in frames with uniform clearances and bevels. Machine doors for hardware. Seal cut surfaces after fitting and machining.
- C. Do not impair utility or structural strength of doors in fitting to the opening, in applying hardware, preparing lights, louvers, or plant-ons or other detailing.
- D. Install pre-fit and pre-machined doors in accordance with manufacturer's data. Install with a maximum clearance of 1/8 inch on the lock side, 1/8 inch between meeting edges of paired doors and 1/8 inch between top of door and frame header.
- E. If not pre-machined, use a minimum of 1 hinge for each 30 inches of door height. Equally space hinges when using 3 or more.
- F. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer. Machine doors for hardware. Seal cut surfaces after fitting and machining.
  1. Fitting Clearances:
    - a. Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors.
    - b. Provide 1/4 – 3/8-inch (6 – 9.5 mm) from bottom of door to top of decorative floor finish or covering.
    - c. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold.
- G. Doors may not extend beyond 1/16 inch from the face of the jamb nor more than 1/8 inch behind jamb face.
- H. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- I. Cutouts, Recesses, and Exposed Rail Edges: Unless factory provided, paint with two coats of clear sealer, each coat well dried, before hardware is set in place.
- J. Meeting stiles of pairs of doors shall be in alignment along the entire height, and offset between adjacent leaves shall not exceed 1/8-inch

### 3.3 ADJUSTMENT AND CLEANING

- A. Adjust doors for smooth and balanced movement.

- B. Operation: Rehang or replace doors that do not swing or operate freely.
- C. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.
- D. Construction Waste Management: Manage construction waste in accordance with provisions of Section **[ADDENDUM 3] 01 35 13.26** Construction Waste Management. Submit documentation for Credit MR 2 to satisfy the requirements of that Section.
- E. Clean glass and hardware units promptly after installation in accordance with manufacturer's printed instructions.
- F. Protect installed units to ensure that they are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08 14 16

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**[ADDENDUM 4] SECTION 08 71 00 - DOOR HARDWARE**

**PART 1 - GENERAL**

**1.1 SUMMARY:**

- A. Section Includes: Finish Hardware for door openings, except as otherwise specified herein.
  - 1. Door hardware for steel (hollow metal) doors.
  - 2. Door hardware for aluminum doors.
  - 3. Door hardware for wood doors.
  - 4. Door hardware for other doors indicated.
  - 5. Keyed cylinders as indicated.
- B. Related Sections:
  - 1. Division 6: Rough Carpentry.
  - 2. Division 8: Aluminum Doors and Frames
  - 3. Division 8: Hollow Metal Doors and Frames.
  - 4. Division 8: Wood Doors.
  - 5. Division 26 Electrical
  - 6. Division 28: Electronic Security
- C. References: Comply with applicable requirements of the following standards. Where these standards conflict with other specific requirements, the most restrictive shall govern.
  - 1. Builders Hardware Manufacturing Association (BHMA)
  - 2. NFPA 101 Life Safety Code
  - 3. NFPA 80 -Fire Doors and Windows
  - 4. ANSI-A156.xx- Various Performance Standards for Finish Hardware
  - 5. UL10C – Positive Pressure Fire Test of Door Assemblies
  - 6. ANSI-A117.1 – Accessible and Usable Buildings and Facilities
  - 7. DHI /ANSI A115.IG – Installation Guide for Doors and Hardware
  - 8. ICC – International Building Code
- D. Intent of Hardware Groups
  - 1. Should items of hardware not specified definitely be required for completion of the Work, furnish such items of type and quality comparable to adjacent hardware and appropriate for service required.
  - 2. Where items of hardware aren't definitely or correctly specified, are required for completion of the Work, a written statement of such omission, error, or other discrepancy to be submitted to Architect, prior to date specified for receipt of bids for clarification by addendum; or, furnish such items in the type and quality established by this specification, and appropriate to the service intended.
- E. Allowances
  - 1. Refer to Division 1 for allowance amount and procedures.

F. Alternates

1. Refer to Division 1 for Alternates and procedures.

1.2 SUBSTITUTIONS:

- A. Comply with Division 1.

1.3 SUBMITTALS:

- A. Comply with Division 1.

- B. Special Submittal Requirements: Combine submittals of this Section with Sections listed below to ensure the "design intent" of the system/assembly is understood and can be reviewed together.

- C. Product Data: Manufacturer's specifications and technical data including the following:

1. Detailed specification of construction and fabrication.
2. Manufacturer's installation instructions.
3. Wiring diagrams for each electric product specified. Coordinate voltage with electrical before submitting.
4. Submit 6 copies of catalog cuts with hardware schedule.
5. Provide 9001-Quality Management and 14001-Environmental Management for products listed in Materials Section 2.2

- D. Shop Drawings - Hardware Schedule: Submit 6 complete reproducible copy of detailed hardware schedule in a vertical format.

1. List groups and suffixes in proper sequence.
2. Completely describe door and list architectural door number.
3. Manufacturer, product name, and catalog number.
4. Function, type, and style.
5. Size and finish of each item.
6. Mounting heights.
7. Explanation of abbreviations and symbols used within schedule.
8. Detailed wiring diagrams, specially developed for each opening, indicating all electric hardware, security equipment and access control equipment, and door and frame rough-ins required for specific opening.

- E. Templates: Submit templates and "reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.

1. Templates, wiring diagrams and "reviewed Hardware Schedule" of electrical terms to electrical for coordination and verification of voltages and locations.

- F. Samples: (If requested by the Architect)

1. 1 sample of Lever and Rose/Escutcheon design, (pair).
2. 3 samples of metal finishes



- G. Contract Closeout Submittals: Comply with Division 1 including specific requirements indicated.

1. Operating and maintenance manuals: Submit 3 sets containing the following.
  - a. Complete information in care, maintenance, and adjustment, and data on repair and replacement parts, and information on preservation of finishes.
  - b. Catalog pages for each product.
  - c. Name, address, and phone number of local representative for each manufacturer.
  - d. Parts list for each product.
2. Copy of final hardware schedule, edited to reflect, "As installed".
3. Copy of final keying schedule
4. As installed "Wiring Diagrams" for each piece of hardware connected to power, both low voltage and 110 volts.
5. One set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

**1.4 QUALITY ASSURANCE**

- A. Comply with Division 1.

1. Statement of qualification for distributor and installers.
2. Statement of compliance with regulatory requirements and single source responsibility.
3. Distributor's Qualifications: Firm with 3 years' experience in the distribution of commercial hardware.
  - a. Distributor to employ full time Architectural Hardware Consultants (AHC) for the purpose of scheduling and coordinating hardware and establishing keying schedule.
  - b. Hardware Schedule shall be prepared and signed by an AHC.
4. Installer's Qualifications: Firm with 3 years experienced in installation of similar hardware to that required for this Project, including specific requirements indicated.
5. Regulatory Label Requirements: Provide testing agency label or stamp on hardware for labeled openings.
  - a. Provide UL listed hardware for labeled and 20 minute openings in conformance with requirements for class of opening scheduled.
  - b. Underwriters Laboratories requirements have precedence over this specification where conflict exists.
6. Single Source Responsibility: Except where specified in hardware schedule, furnish products of only one manufacturer for each type of hardware.

- B. Review Project for extent of finish hardware required to complete the Work. Where there is a conflict between these Specifications and the existing hardware, notify the Architect in writing and furnish hardware in compliance with the Specification unless otherwise directed in writing by the Architect.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Packing and Shipping: Comply with Division 1.
  - 1. Deliver products in original unopened packaging with legible manufacturer's identification.
  - 2. Package hardware to prevent damage during transit and storage.
  - 3. Mark hardware to correspond with "reviewed hardware schedule".
  - 4. Deliver hardware to door and frame manufacturer upon request.
- B. Storage and Protection: Comply with manufacturer's recommendations.

**1.6 PROJECT CONDITIONS:**

- A. Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.
- B. Review Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.

**1.7 WARRANTY:**

- A. Refer to Conditions of the Contract
- B. Manufacturer's Warranty:
  - 1. Closers: Ten years
  - 2. Exit Devices: Five Years
  - 3. Locksets & Cylinders: Three years
  - 4. All other Hardware: Two years.

**1.8 OWNER'S INSTRUCTION:**

- A. Instruct Owner's personnel in operation and maintenance of hardware units.

**1.9 MAINTENANCE:**

- A. Extra Service Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout Submittals Section.
  - 1. Special Tools: Provide special wrenches and tools applicable to each different or special hardware component.
  - 2. Maintenance Tools: Provide maintenance tools and accessories supplied by hardware component manufacturer.
  - 3. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra service materials.

- B. Maintenance Service: Submit for Owner's consideration maintenance service agreement for electronic products installed.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

- A. The following manufacturers are approved subject to compliance with requirements of the Contract Documents. Approval of manufacturers other than those listed shall be in accordance with Division 1.

<u>Item:</u>	<u>Manufacturer:</u>	<u>Approved:</u>
Hinges	Stanley	Bommer, McKinney
Continuous Hinges	Stanley	Select, ABH
Locksets	Best	
Cylinders	Best	
Exit Devices	Precision	Von Duprin,
Closers	Stanley D-4550	Dorma 8900, Norton 7500
Automatic Operators	Stanley D-4990	LCN 4640, Norton
Push/Pull Plates	Trimco	Burns, Rockwood
Push/Pull Bars	Trimco	Burns, Rockwood
Protection Plates	Trimco	Burns, Rockwood
Overhead Stops	ABH	Rixson, Glynn Johnson
Door Stops	Trimco	Burns, Rockwood
Flush Bolts	Trimco	ABH, Burns
Coordinator & Brackets	Trimco	ABH, Burns
Threshold & Gasketing	National Guard	Reese, K.N. Crowder

### 2.2 MATERIALS:

- A. Hinges: Shall be Five Knuckle Ball bearing hinges
1. Template screw hole locations
  2. Bearings are to be fully hardened.
  3. Bearing shell is to be consistent shape with barrel.
  4. Minimum of 2 permanently lubricated non-detachable bearings on standard weight hinge and 4 permanently lubricated bearing on heavy weight hinges.
  5. Equip with easily seated, non-rising pins.
  6. Non Removable Pin screws shall be slotted stainless steel screws.
  7. Hinges shall be full polished, front, back and barrel.
  8. Hinge pin is to be fully plated.
  9. Bearing assembly is to be installed after plating.
  10. Sufficient size to allow 180-degree swing of door
  11. Furnish five knuckles with flush ball bearings
  12. Provide hinge type as listed in schedule.
  13. Furnish 3 hinges per leaf to 7 foot 6 inch height. Add one for each additional 30 inches in height or fraction thereof.
  14. Tested and approved by BHMA for all applicable ANSI Standards for type, size, function and finish
  15. UL10C listed for Fire rated doors.

**B. Geared Continuous Hinges:**

1. Tested and approved by BHMA for ANSI A156.26-1996 Grade 1
2. Anti-spinning through fastener
3. UL10C listed for 3 hour Fire rating
4. Non-handed
5. Lifetime warranty
6. Provide Fire Pins for 3-hour fire ratings
7. Sufficient size to permit door to swing 180 degrees

**C. Mortise Type Locks and Latches:**

1. Tested and approved by BHMA for ANSI A156.13, Series 1000, Operational Grade 1, Extra-Heavy Duty, Security Grade 2 and be UL10C.
2. Furnish UL or recognized independent laboratory certified mechanical operational testing to 4 million cycles minimum.
3. Provide 9001-Quality Management and 14001-Environmental Management.
4. Fit ANSI A115.1 door preparation
5. Functions and design as indicated in the hardware groups
6. Solid, one-piece, 3/4-inch (19mm) throw, anti-friction latchbolt made of self-lubricating stainless steel
7. Deadbolt functions shall have 1 inch (25mm) throw bolt made of hardened stainless steel
8. Latchbolt and Deadbolt are to extend into the case a minimum of 3/8 inch (9.5mm) when fully extended
9. Auxiliary deadlatch to be made of one piece stainless steel, permanently lubricated
10. Provide sufficient curved strike lip to protect door trim
11. Lever handles must be of forged or cast brass, bronze or stainless steel construction and conform to ANSI A117.1. Levers that contain a hollow cavity are not acceptable
12. Lock shall have self-aligning, thru-bolted trim
13. Levers to operate a roller bearing spindle hub mechanism
14. Mortise cylinders of lock shall have a concealed internal setscrew for securing the cylinder to the lockset. The internal setscrew will be accessible only by removing the core, with the control key, from the cylinder body.
15. Spindle to be designed to prevent forced entry from attacking of lever
16. Provide locksets with 7-pin removable and interchangeable core cylinders
17. Each lever to have independent spring mechanism controlling it
18. Core face must be the same finish as the lockset.

**D. Cylindrical Type Locks and Latchsets:**

1. Tested and approved by BHMA for ANSI A156.2, Series 4000, Operational Grade 1, Extra-Heavy Duty, and be UL10C listed.
2. Provide 9001-Quality Management and 14001-Environmental Management.
3. Fit modified ANSI A115.2 door preparation.
4. Locksets and cores to be of the same manufacturer to maintain complete lockset warranty
5. Locksets to have anti-rotational studs that are thru-bolted
6. Keyed lever shall not have exposed "keeper" hole
7. Each lever to have independent spring mechanism controlling it
8. 2-3/4 inch (70 mm) backset
9. 9/16 inch (14 mm) throw latchbolt
10. Provide sufficient curved strike lip to protect door trim

11. Outside lever sleeve to be seamless, of one-piece construction made of a hardened steel alloy
12. Keyed lever to be removable only after core is removed, by authorized control key
13. Provide locksets with 7-pin removable and interchangeable core cylinders
14. Hub, side plate, shrouded rose, locking pin to be a one-piece casting with a shrouded locking lug.
15. Locksets outside locked lever must withstand minimum 1400 inch pounds of torque. In excess of that, a replaceable part will shear. Key from outside and inside lever will still operate lockset.
16. Core face must be the same finish as the lockset.
17. Functions and design as indicated in the hardware groups.

**E. Exit Devices:**

1. Exit devices to meet or exceed BHMA for ANSI 156.3, Grade 1.
2. Exit devices to be tested and certified by UL or by a recognized independent laboratory for mechanical operational testing to 9 million cycles minimum with inspection confirming Grade 1 Loaded Forces have been maintained.
3. Exit devices chassis to be investment cast steel, zinc dichromate.
4. Exit devices to have stainless steel deadlocking  $\frac{3}{4}$ " through latch bolt.
5. Exit devices to be equipped with sound dampening on touchbar.
6. Non-fire rated exit devices to have cylinder dogging.
7. Non-fire rated exit devices to have  $\frac{1}{4}$ " minimum turn hex key dogging.
8. Touchpad to be "T" style constructed of architectural metal with matching metal end caps.
9. Touchbar assembly on wide style exit devices to have a  $\frac{1}{4}$ " clearance to allow for vision frames.
10. All exposed exit device components to be of architectural metals and "true" architectural finishes.
11. Provide strikes as required by application.
12. Fire exit hardware to conform to UL10C and UBC 7-2. UL tested for Accident Hazard.
13. Exit device to be heavy investment cast stainless steel with black powder coated finish.
14. Exit devices to have field reversible handing.
15. Provide heavy duty vandal resistant lever trim with heavy duty investment cast stainless steel components and extra strength shock absorbing overload springs. Lever shall not require resetting. Lever design to match locksets and latchsets.
16. Provide 9001-Quality Management and 14001-Environmental Management.
17. Vertical Latch Assemblies to have gravity operation, no springs.
18. Approved Manufacturers
  - a. The following manufacturers will be approved contingent on meeting or exceeding the above performance criteria:
    - 1) Precision Manufactured by Stanley Security Solutions

**F. Cylinders:**

1. Provide the necessary cylinder housings, collars, rings & springs as recommended by the manufacturer for proper installation.
2. Provide the proper cylinder cams or tail piece as required to operate all locksets and other keyed hardware items listed in the hardware sets.
3. Coordinate and provide as required for related sections.

G. Door Closers shall:

1. Tested and approved by BHMA for ANSI 156.4, Grade 1
2. UL10C certified
3. Provide 9001-Quality Management and 14001-Environmental Management.
4. Closer shall have extra-duty arms and knuckles
5. Conform to ANSI 117.1
6. Maximum 2 7/16 inch case projection with non-ferrous cover
7. Separate adjusting valves for closing and latching speed, and backcheck
8. Provide adapter plates, shim spacers and blade stop spacers as required by frame and door conditions
9. Full rack and pinion type closer with 1½" minimum bore
10. Mount closers on non-public side of door, unless otherwise noted in specification
11. Closers shall be non-handed, non-sized and multi-sized.

H. Low Energy Operators shall:

1. Conform to ANSI/BHMA A156.19 as a low energy power opening device.
2. Be listed under UL228, UL325, UL10B, UL10C, UBC 7.2 and FCC listed.
3. Shall be non-handed.
4. Be rated for door panels weighing up to 350 lbs (160 kg).
5. The manual door closer within the Low Energy Operator shall be adjusted to meet Americans with Disabilities Act (ADA) 5 lbs opening force [Push-Side applications only]
6. Operator shall be isolated from mounting plate with rubber mounts to mitigate the transmission of forces between the door and the operator.
7. Shall have a position encoder to communicate with microprocessor.
8. Incorporate a resettable powered operation counter that tracks both powered and non-powered cycling of the Operator.
9. Incorporate the following adjustable settings:
  - i. Hold Open Timer, to 28 seconds
  - ii. Open Speed
  - iii. Backcheck Speed
  - iv. Vestibule Sequence Timer
10. Include DIP switch controls for:
  - i. On board diagnostics
  - ii. Power close
  - iii. Push and Go operation
  - iv. Time delay logic for electrified hardware components
11. Include terminals for auxiliary controls including:
  - i. Activation devices; provide two discrete inputs
  - ii. Vestibule sequencing
12. Control switches including:
  - i. Day/Night open (illuminated)
  - ii. Power On-Off
13. Includes adhesive Low Energy Operator mounting templates.
14. R-14 Aluminum Allow Materials
15. For non-powered operation, the unit shall function as a standard door closer with adjustable spring force size 1 thru 6.

I. Door Stops: Provide a dome floor or wall stop for every opening as listed in the hardware sets.

1. Wall stop and floor stop shall be wrought bronze, brass or stainless steel.

2. Provide fastener suitable for wall construction.
  3. Coordinate reinforcement of walls where wall stop is specified.
  4. Provide dome stops where wall stops are not practical. Provide spacers or carpet riser for floor conditions encountered
- J. Over Head Stops: Provide a Surface mounted or concealed overhead when a floor or wall stop cannot be used or when listed in the hardware set.
1. Concealed overhead stops shall be heavy duty bronze or stainless steel.
  2. Surface overhead stops shall be heavy duty bronze or stainless steel.
- K. Push Plates: Provide with four beveled edges ANSI J301, .050 thickness, size as indicated in hardware set. Furnish oval-head countersunk screws to match finish.
- L. Pulls with plates: Provide with four beveled edges ANSI J301, .050 thickness Plates with ANSI J401 Pull as listed in hardware set. Provide proper fasteners for door construction.
- M. Push Pull Bars: Provide ANSI J504, .1" Dia. Pull and push bar model and series as listed in hardware set. Provide proper fasteners for door construction.
- N. Kickplates: Provide with four beveled edges ANSI J102, 10 inches high by width less 2 inches on single doors and 1 inch on pairs of doors. Furnish oval-head countersunk screws to match finish.
- O. Mop plates: Provide with four beveled edges ANSI J103, 4 inches high by width less 1 inch on single doors and 1 inch on pairs of doors. Furnish oval-head countersunk screws to match finish.
- P. Armor Plates: Provide ANSI J101 with four beveled edges, 40 inches high by width less 1 inch on single or pairs of doors. Furnish oval-head countersunk screws to match finish.
1. Provide cutouts for hardware as listed in the hardware sets.
  2. Provide Warnock Hersey labeled plates for 3 hour metal fire doors where allowed by local authority.
- Q. Door Bolts: Flush bolts for wood or metal doors.
1. Provide a set of Automatic bolts, Certified ANSI/BHMA 156.3 Type 25 for hollow metal label doors.
  2. Provide a set of Automatic bolts, Certified ANSI/BHMA 156.3 Type 27 at wood label doors.
  3. Manual flush bolts, Certified ANSI/BHMA 156.16 at openings where allowed local authority.
  4. Provide Dust Proof Strike, Certified ANSI/BHMA 156.16 at doors with flush bolts without thresholds.
- R. Coordinator and Brackets: Provide a surface mounted coordinator when automatic bolts are used in the hardware set.
1. Coordinator, Certified ANSI/BHMA A1156.3 Type 21A for full width of the opening.
  2. Provide mounting brackets for soffit applied hardware.
  3. Provide hardware preparation (cutouts) for latches as necessary.

- S. Magnetic Door Holders: Provide magnetic door holders with Tri-Voltage that can be wired 12VDC, 24V AC/DC or 120V AC
  - 1. Wall magnetic door holders shall be **[Recessed, Surface or Flush mounted]**.
  - 2. Armature shall be thru-bolted and can be provided with any projection required.
  - 3. Models will be available in US28, sprayed finishes and US32D.
  - 4. Floor mounted shall be provided for a single door or double door hold open application.
- T. Seals: All seals shall be finished to match adjacent frame color. Seals shall be furnished as listed in schedule. Material shall be UL listed for labeled openings.
- U. Weatherstripping: Provide at head and jambs only those units where resilient or flexible seal strip is easily replaceable. Where bar-type weatherstrip is used with parallel arm mounted closers install weatherstrip first.
  - 1. Weatherstrip shall be resilient seal of (Neoprene, Polyurethane, Vinyl, Pile, Nylon Brush, Silicone)
  - 2. UL10C Positive Pressure rated seal set when required.
- V. Door Bottoms/Sweeps: Surface mounted or concealed door bottom where listed in the hardware sets.
  - 1. Door seal shall be resilient seal of (Neoprene, Polyurethane, Nylon Brush, Silicone)
  - 2. UL10C Positive Pressure rated seal set when required.
- W. Thresholds: Thresholds shall be aluminum beveled type with maximum height of ½” for conformance with ADA requirements. Furnish as specified and per details. Provide fasteners and screws suitable for floor conditions.
- X. Provide one wall mounted Telkee, Lund or MMF series key cabinet complete with hooks, index and tags to accommodate 50% expansion. Coordinate mounting location with architect.
- Y. Key Control Software: Provide one, Keystone® 600N key management control software. Shall include general features
  - 1. Password restricted logins.
  - 2. List all keys and items currently due back (or due back by any day designated)
  - 3. Lists all cores and their location, building and doors, and cross-references people to cores, doors, and building they access.
  - 4. Comprehensive list of reports available as an on-screen menu.
  - 5. Built-in easy to use backup program.
  - 6. Program always displays date of last backup.
  - 7. Dynamic searching capabilities for all records.
  - 8. On-screen indicator shows when historical info. Is present for a record.
  - 9. On-screen indicator appears when notes are present on a record.
  - 10. Able to operate in an NTFS network environment with TCPIP protocol
  - 11. Multiple users can access program at the same time.
  - 12. Software shall include a “Best” Automated Pin Segment Calculator and a Manual Pin Segment Calculator for authorized “Best” building lock shop facilities.



13. Software program is to be compatible with Windows NT, 2000 or XP with TCPIP protocol.

Z. Silencers: Furnish silencers on all interior frames, 3 for single doors, 2 for pairs. Omit where any type of seals occur.

**2.3 FINISH:**

A. Designations used in Schedule of Finish Hardware - 3.05, and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 including coordination with traditional U.S. finishes shown by certain manufacturers for their products

B. Powder coat door closers to match other hardware, unless otherwise noted.

C. Aluminum items shall be finished to match predominant adjacent material. Seals to coordinate with frame color.

**2.4 KEYS AND KEYING:**

A. Provide keyed brass construction cores and keys during the construction period. Construction control and operating keys and core shall not be part of the Owner's permanent keying system or furnished in the same keyway (or key section) as the Owner's permanent keying system. Permanent cores and keys (prepared according to the accepted keying schedule) will be furnished to the Owner.

B. Cylinders, removable and interchangeable core system: Best CORMAX™ Patented 7-pin.

C. Permanent keys and cores: Stamped with the applicable key mark for identification. These visual key control marks or codes will not include the actual key cuts. Permanent keys will also be stamped "Do Not Duplicate."

D. Transmit Grand Masterkeys, Masterkeys and other Security keys to Owner by Registered Mail, return receipt requested.

E. Furnish keys in the following quantities:

1. 1 each Grand Masterkeys
2. 4 each Masterkeys
3. 2 each Change keys each keyed core
4. 15 each Construction masterkeys
5. 1 each Control keys

F. The Owner, or the Owner's agent, will install permanent cores and return the construction cores to the Hardware Supplier. Construction cores and keys remain the property of the Hardware Supplier.

G. Keying Schedule: Arrange for a keying meeting, and programming meeting with Architect Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying and programming complies with project requirements. Furnish 3 typed copies of keying and programming schedule to Architect.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Verification of conditions: Examine doors, frames, related items and conditions under which Work is to be performed and identify conditions detrimental to proper and or timely completion.
  - 1. Do not proceed until unsatisfactory conditions have been corrected.

**3.2 HARDWARE LOCATIONS:**

- A. Mount hardware units at heights indicated in the following publications except as specifically indicated or required to comply with the governing regulations.
  - 1. Recommended Locations for Builder's Hardware for Standard Steel Doors and Frames, by the Door and Hardware Institute (DHI).
  - 2. Recommended locations for Architectural Hardware for flush wood doors (DHI).
  - 3. WDMA Industry Standard I.S.-1A-04, Industry Standard for Architectural wood flush doors.

**3.3 INSTALLATION:**

- A. Install each hardware item per manufacturer's instructions and recommendations. Do not install surface mounted items until finishes have been completed on the substrate. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- B. Conform to local governing agency security ordinance.
- C. Install Conforming to ICC/ANSI A117.1 Accessible and Usable Building and Facilities.
  - 1. Adjust door closer sweep periods so that from the open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the landing side of the door.
- D. Installed hardware using the manufacturers fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use "Riv-Nuts" or similar products.

**3.4 FIELD QUALITY CONTROL AND FINAL ADJUSTMENT**

- A. Contractor/Installers, Field Services: After installation is complete, contractor shall inspect the completed door openings on site to verify installation of hardware is complete and properly adjusted, in accordance with both the Contract Documents and final shop drawings.
  - 1. Check and adjust closers to ensure proper operation.
  - 2. Check latchset, lockset, and exit devices are properly installed and adjusted to ensure proper operation.

3. Make final adjustments to electric hardware following security system turn-up and powering of locks. Coordinate with security contractor to test each door with access card.
  - a. Verify levers are free from binding.
  - b. Ensure latchbolts and dead bolts are engaged into strike and hardware is functioning.
4. Report findings, in writing, to architect indicating that all hardware is installed and functioning properly. Include recommendations outlining corrective actions for improperly functioning hardware if required.

3.5 SCHEDULE OF FINISH HARDWARE:

**Manufacturer List**

<u>Code</u>	<u>Name</u>
AB	ABH Manufacturing Inc.
AD	Adams Rite
BE	Best Access Systems
BY	By Others
MC	McKinney
NA	National Guard
PR	Precision
SD	Stanley Door Closers
SENT	Sentrol
ST	Stanley
STAN	Stanley
TR	Trimco

**Finish List**

<b><u>Code</u></b>	<b><u>Description</u></b>
1D	Dull Black
AL	Aluminum
BR	Bronze
PC	Prime Coat
26D	Satin Chrome
499	Polished Brass, No Lacquer (US3NL)
605	Bright Brass, Clear Coated
622	Flat Black Coated
626	Satin Chromium Plated
628	Satin Aluminum, Clear Anodized
630	Satin Stainless Steel
689	Aluminum Painted
GREY	Grey
US28	Aluminum - Clear Anodized
US26D	Chromium Plated, Dull
US32D	Stainless Steel, Dull

**Option List**

<b><u>Code</u></b>	<b><u>Description</u></b>
CD	CYLINDER DOGGING
TS	TOUCHBAR MONITORING SWITCH
B4E	BEVELED 4 EDGES - ARMOR PLATES
B4E	BEVELED 4 EDGES - KICK PLATES
ELR	ELECTRIC LATCH RETRACTION
RQE	REQUEST TO EXIT
WTS	Weatherized Touchbar Monitoring Switch
C181	CAM-ADAMS RITE MS CAM
EPT Prep	EPT Prep (full mortise)
2" EXTENSION	2" EXTENSION FOR WALL MAGNETS
C-SUNK HOLES	COUNTER SINKING OF KICK and MOP PLATES
10-24 SSMS/LA	STAINLESS MACHINE SCREWS/LEAD ANCHOR

**Hardware Sets**

**SET #01 -**

1	Continuous Hinge	661 HD UL X EPT Prep	AL	ST
1	Exit Device	TS E2103 X 4908D CD	630	PR
1	Mortise Cylinder	1E-74 PATD	626	BE
1	Rim Cylinder	12E-72 PATD	605	BE
1	Concealed Overhead Closer	BY ALUM DOOR MFG	689	BY
1	Floor Stop	1209	630	TR
1	Set of Weatherstripping	161 SA @ Head and Jambs		NA
1	Saddle Threshold	425A 1/4-20 SSMSLA	AL	NA
1	Door Position Switch	1076D	BR	SENT
1	Power Transfer	PT1000	US28	AB
1	Card Reader	Furnished and installed per Section 28 13 00	BY	VENDOR

NOTE: The Electrified Exterior Door Trim is locked unless energized - Fail Secure (FSE). Presentation of a Valid Credential to the Card Reader momentarily unlocks the trim, permitting ingress. Ingress is also by Keyed Cylinder. Request-to-Exit Switch (TS) shunts Door Position Switch during egress, preventing an alarm. Power Supply furnished by Security Contractor. Balance of Hardware by Aluminum Door Supplier. Note: Electrified Exit Device Trim requires a 4-1/2" wide Aluminum Stile Door (Medium Stile Door).

**SET #02 -**

1	Continuous Hinge	661 HD UL X EPT Prep	AL	ST
1	Exit Device	TS E2103 X 4908D CD	630	PR
1	Mortise Cylinder	1E-74 PATD	626	BE
1	Rim Cylinder	12E-72 PATD	605	BE
1	Concealed Overhead Closer	BY ALUM DOOR MFG	689	BY
1	Floor Stop	1209	630	TR
1	Sound Gasketing	5050 B		NA
1	Door Sweep	200 NA		NA
1	Door Position Switch	1076D	BR	SENT
1	Power Transfer	PT1000	US28	AB
1	Card Reader	Furnished and installed per Section 28 13 00	BY	VENDOR

NOTE: The Electrified Exterior Door Trim is locked unless energized - Fail Secure (FSE). Presentation of a Valid Credential to the Card Reader momentarily unlocks the trim, permitting ingress. Ingress is also by Keyed Cylinder. Request-to-Exit Switch (TS) shunts Door Position Switch during egress, preventing an alarm. Power Supply furnished by Security Contractor. Balance of Hardware by Aluminum Door Supplier. Note: Electrified Exit Device Trim requires a 4-1/2" wide Aluminum Stile Door (Medium Stile Door).

**SET #03 -**

3	Hinges	FBB179 4 1/2 X 4 1/2	US26D	ST
1	Classroom Lock	9K3-7R14C PATD	626	BE
1	Wall Stop	1270WV	630	TR
1	Sound Gasketing	5050 B		NA
1	Door Sweep	200 NA		NA
1	Saddle Threshold	425A 1/4-20 SSMSLA	AL	NA

**SET #04 -**

**Bid Set**

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**ADDENDUM 4**

**Door Hardware**

**08 71 00**

**REV 11/21/17**

3	Hinges	FBF179 4 1/2 X 4 1/2	US26D	ST
1	Classroom Lock	9K3-7R14C PATD	626	BE
1	Electric Strike	ES5 A S	630	BE
1	Wall Stop	1270WV	630	TR
1	Sound Gasketing	5050 B		NA
1	Door Sweep	200 NA		NA
1	Saddle Threshold	425A 1/4-20 SSMSLA	AL	NA
1	Door Closer	CLD-4551 T	689	SD
1	Door Position Switch	1076D	BR	SENT
1	Power Transfer	PT1000	US28	AB
1	Card Reader	Furnished and installed per Section 28 13 00	BY	VENDOR

NOTE: Classroom Function Lock. Ingress by key when locked or by presentation of a valid credential to the Card Reader energizes the electric strike permitting entry. Egress is always free. Power Supply and Card Reader by Security Contractor.

**SET #05 -**

1	Continuous Hinge	661 HD UL	AL	ST
1	Deadlock	MS1850SN	628	AD
1	Mortise Cylinders	1E-74 PATD C181	626	BE
1	Push/Pull Set	1732 32"	630	TR
1	Concealed Overhead Closer	BY ALUM DOOR MFG	689	BY
1	Door Stop	1209	630	TR
1	Set of Weatherstripping	161 SA @ Head and Jambs		NA
1	Door Sweep	200 NA		NA
1	Saddle Threshold	425A 1/4-20 SSMSLA	AL	NA
1	Door Position Switch	1076D	BR	SENT

NOTE: Balance of Hardware by Aluminum Door Supplier.

**SET #06 -**

3	Hinges	FBF179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Storeroom Lock	9K3-7D14C PATD	626	BE
1	Door Closer	CLD-4551 EDA	689	SD
1	Kick Plate	KO050 10" x 34" B4E	630	TR
1	Floor Stop	1209	630	TR
1	Gasketing	5050 B		NA

**SET #07 -**

3	Hinges	FBF179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Storeroom Lock	9K3-7D14C PATD	626	BE
1	Floor Stop	1209	630	TR
3	Door Silencers	1229A	GREY	TR

**SET #08 -**

1	Continuous Hinge	661 HD UL X EPT Prep	AL	ST
1	Exit Device	TS 2103 X 4903D CD	630	PR
1	Rim Cylinder	12E-72 PATD	605	BE
1	Concealed Overhead Closer	BY ALUM DOOR MFG	689	BY
1	Door Stop	1209HO	630	TR
1	Set of Weatherstripping	161 SA @ Head and Jambs		NA
1	Door Sweep	200 NA		NA
1	Saddle Threshold	425A 1/4-20 SSMSLA	AL	NA
1	Door Position Switch	1076D	BR	SENT
1	Power Transfer	PT1000	US28	AB

NOTE: Touch Switch in bar (Request to Exit) shunts door contact to prevent alarm on exit.  
Balance of Door Hardware by Aluminum Door Supplier.

**SET #09 -**

3	Hinges	FBF179 4 1/2 X 4 1/2	US26D	ST
1	Office Lock	9K3-7AB14C PATD	626	BE
1	Wall Stop	1270WV	630	TR
1	Gasketing	5050 B		NA
1	Door Sweep	200 NA		NA
1	Saddle Threshold	425A 1/4-20 SSMSLA	AL	NA

**SET #10 -**

1	Continuous Hinge	661 HD UL	AL	ST
1	Deadlock	MS1850SN	628	AD
1	Mortise Cylinder	1E-74 PATD C181	626	BE
1	Push/Pull Set	1732 32"	630	TR
1	Floor Stop	1209OH	630	TR
1	Door Position Switch	1076D	BR	SENT
1	Drip Cap	16 A WOD + 4"		NA
1	Set of Weatherstripping	161 SA @ Head and Jambs		NA
1	Door Sweep	200 NA		NA
1	Saddle Threshold	425A 1/4-20 SSMSLA	AL	NA

**SET #11 -**

2	Continuous Hinges	661 HD UL X EPT Prep	AL	ST
1	Exit Device	ELR TS E2703 X 4908D CD	630	PR
1	Exit Device	ELR TS 2701 X 4901 CD	630	PR
2	Mortise Cylinders	1E-74 PATD	626	BE
2	Rim Cylinder	12E-72 PATD	605	BE
2	Concealed Overhead Closer	BY ALUM DOOR MFG	689	BY
2	Floor Stops	1209	630	TR
1	Set of Weatherstripping	161 SA @ Head and Jambs		NA
1	Door Sweep	200 NA		NA
1	Saddle Threshold	425A 1/4-20 SSMSLA	AL	NA
2	Door Position Switches	1076D	BR	SENT
2	Power Transfers	PT1000	US28	AB
1	Card Reader	Furnished and installed per Section 28 13 00	BY	VENDOR

NOTE: The Electrified Exterior Door Trim is locked unless energized - Fail Secure (FSE).

Ingress is also by Keyed Cylinder. Request-to-Exit Switch (TS) shunts Door Position Switch during egress, preventing an alarm. Power Supply furnished by Security Contractor. Balance of Hardware by Aluminum Door Supplier. Note: Electrified Exit Device Trim requires a 4-1/2" wide Aluminum Stile Door.

**SET #12 -**

2	Continuous Hinges	661 HD UL X EPT Prep	AL	ST
1	Classroom Lock	9K3-7R14C PATD	626	BE
2	Mortise Cylinders	1E-74 PATD	626	BE
2	Concealed Overhead Closer	BY ALUM DOOR MFG	689	BY
2	Flush Bolts	3917-12	626	TR
2	Dustproof Strikes	3910	630	TR
2	Floor Stops	1209	630	TR
1	Set of Weatherstripping	161 SA @ Head and Jambs		NA
1	Door Sweep	200 NA		NA
1	Saddle Threshold	425A 1/4-20 SSMSLA	AL	NA
2	Door Position Switches	1076D	BR	SENT
2	Power Transfers	PT1000	US28	AB
1	Card Reader	Furnished and installed per Section 28 13 00	BY	VENDOR

NOTE: The Electrified Exterior Door Trim is locked unless energized - Fail Secure (FSE). Power Supply furnished by Security Contractor. Balance of Hardware by Aluminum Door Supplier.

**SET #13 -**

2	Continuous Hinges	661 HD UL X EPT Prep	AL	ST
1	Exit Device	ELR TS E2703 X 4908D CD	630	PR
1	Exit Device	ELR TS 2701 X 4901 CD	630	PR
2	Mortise Cylinders	1E-74 PATD	626	BE
2	Rim Cylinder	12E-72 PATD	605	BE
2	Floor Stops	1209	630	TR
1	Set of Weatherstripping	161 SA @ Head and Jambs		NA
1	Door Sweep	200 NA		NA
1	Saddle Threshold	425A 1/4-20 SSMSLA	AL	NA
2	Low Energy Operators	CLD-4990	628	SD
2	Door Position Switches	1076D	BR	SENT
2	Power Transfers	PT1000	US28	AB
1	Actuator/Transmitter Package	CL4976		SD
1	Card Reader	Furnished and installed per Section 28 13 00	BY	VENDOR

NOTE: The Electrified Exterior Door Trim is locked, unless energized - Fail Secure (FSE). Ingress is also by Keyed Cylinder. or by presenting a valid Credential to the Card Reader and activating the trim. Request-to-Exit Switch (TS) shunts Door Position Switch during egress, preventing an alarm. Low Energy Auto Operators activated by Push Pads, which activate Latch Retraction and cycle the doors to open and shut. Exterior Push Pad on timer (by others) to deactivate the system when the center is closed. Power Supply and Card Reader furnished by Security Contractor. Balance of Hardware by Aluminum Door Supplier. Note: Electrified Exit Device Trim requires a 4-1/2" wide Aluminum Stile Door.



**SET #14 -**

3	Hinges	FBF179 4 1/2 X 4 1/2	US26D	ST
1	Electro-mech Lock	9KW3-7DEU14C PATD RQE	626	BE
1	Door Closer	CLD-4551 T	689	SD
1	Kick Plate	KO050 10" x 34" B4E	630	TR
1	Mop Plate	KM050-1 4" x 35" B4E	630	TR
1	Wall Stop	1270WV	630	TR
1	Power Transfer	PT1000	US28	AB
3	Door Silencers	1229A	GREY	TR

NOTE: Electrical trim on the lock permits entry when energized. On loss of power the door is locked to ingress - Fail Secure (FSE). Egress always free.

**SET #15 -**

3	Hinges	FBF179 4 1/2 X 4 1/2	US26D	ST
1	Privacy Set	9K3-0L14D	626	BE
1	Door Closer	CLD-4551 T	689	SD
1	Mop Plate	KM050-1 4" x 35" B4E	630	TR
1	Wall Stop	1270WV	630	TR
3	Door Silencers	1229A	GREY	TR

**SET #16 -**

3	Hinges	FBF191 4 1/2 X 4 1/2 NRP	US32D	ST
1	Electro-mech Lock	9KW3-7DEU14C PATD RQE	626	BE
1	Door Closer	CLD-4551 EDA	689	SD
1	Overhead Stop	4424	US32D	AB
1	Kick Plate	KO050 10" x 34" B4E	630	TR
1	Door Position Switch	1076D	BR	SENT
1	Power Transfer	PT1000	US28	AB
1	Card Reader	Furnished and installed per Section 28 13 00	BY VENDOR	
1	Drip Cap	16 A WOD + 4"		NA
1	Set of Weatherstripping	161 SA @ Head and Jambs		NA
1	Door Sweep	200 NA		NA
1	Saddle Threshold	425A 1/4-20 SSMSLA	AL	NA

NOTE: Door is always locked from ingress side unless energized - Fail Secure (FSE). Ingress is allowed by Keyed Cylinder, or with Card Reader. Egress is always free. Card Reader and Power Supply by Security Contractor.

**SET #17 -**

3	Hinges	FBF179 4 1/2 X 4 1/2	US26D	ST
1	Storeroom Lock	9K3-7D14C PATD	626	BE
1	Mop Plate	KM050-1 4" x 35" B4E	630	TR
1	Wall Stop	1270WV	630	TR
3	Door Silencers	1229A	GREY	TR

**SET #18 -**

3	Hinges	FBF191 4 1/2 X 4 1/2 NRP	US32D	ST
1	Door Closer	CLD-4551 H-EDA	689	SD
1	Kick Plate	KO050 10" x 34" B4E	630	TR
1	Door Stop	1209	630	TR
1	Door Position Switch	1076D	BR	SENT
1	Power Transfer	PT1000	US28	AB
1	Card Reader	Furnished and installed per Section 28 13 00	BY	VENDOR

NOTE: Door is always locked from ingress side unless energized - Fail Secure (FSE).  
Ingress is allowed by Keyed Cylinder, or with Card Reader. Egress is always free. Card Reader and Power Supply by Security Contractor.

**SET #19 -**

3	Hinges	FBF179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Classroom Lock	9K3-7R14C PATD	626	BE
1	Door Closer	CLD-4551 EDA	689	SD
1	Kick Plate	KO050 10" x 34" B4E	630	TR
1	Mop Plate	KM050-1 4" x 35" B4E	630	TR
1	Wall Stop	1270WV	630	TR
3	Door Silencers	1229A	GREY	TR

**SET #20 -**

3	Hinges	FBF179 4 1/2 X 4 1/2	US26D	ST
1	Classroom Lock	9K3-7R14C PATD	626	BE
1	Door Closer	CLD-4551 T	689	SD
1	Kick Plate	KO050 10" x 34" B4E	630	TR
1	Mop Plate	KM050-1 4" x 35" B4E	630	TR
1	Wall Stop	1270WV	630	TR
3	Door Silencers	1229A	GREY	TR

**SET #21 -**

2	Continuous Hinges	661 HD UL X EPT Prep	AL	ST
1	Removable Mullion	KR822	689	PR
1	Exit Device	TS 2103 X 4903D CD	630	PR
1	Exit Device	TS 2102 X 4902D CD	630	PR
2	Mortise Cylinders	1E-74 PATD	626	BE
2	Rim Cylinders	12E-72 PATD	605	BE
2	Concealed Overhead Closers	BY ALUM DOOR MFG	689	BY
2	Door Stops X Holders	1209HO	630	TR
1	Set of Weatherstripping	161 SA @ Head and Jambs		NA
1	Door Sweep	200 NA		NA
1	Saddle Threshold	425A 1/4-20 SSMSLA	AL	NA
2	Door Position Switches	1076D	BR	SENT
2	Power Transfers	PT1000	US28	AB

NOTE: Touch Switch in bar (Request to Exit) shunts door contact to prevent alarm on exit.  
Balance of Door Hardware by Aluminum Door Supplier.

**SET #22 -**

6	Hinges	FBF179 4 1/2 X 4 1/2	US26D	ST
2	Double Dummy Set	9K3 02DT14D	626	BE
2	Door Closers + Hold Open	CLD-4551 H-EDA	689	SD
2	Kick Plates	KO050 10" x 34" B4E	630	TR

NOTE: Doors to be held open at 180 degrees.

**SET #23 -**

1	Continuous Hinge	661 HD UL X EPT Prep	AL	ST
1	Exit Device	TS E2103 X 4908D CD	630	PR
1	Mortise Cylinder	1E-74 PATD	626	BE
1	Rim Cylinder	12E-72 PATD	605	BE
1	Concealed Overhead Closer	BY ALUM DOOR MFG	689	BY
1	Floor Stop & Holder	1224	626	TR
1	Set of Weatherstripping	161 SA @ Head and Jambs		NA
1	Door Sweep	200 NA		NA
1	Saddle Threshold	425A 1/4-20 SSMSLA	AL	NA
1	Door Position Switch	1076D	BR	SENT
1	Power Transfer	PT1000	US28	AB
1	Card Reader	Furnished and installed per Section 28 13 00	BY	VENDOR

NOTE: The Electrified Exterior Door Trim is locked unless energized - Fail Secure (FSE). Ingress is also by Keyed Cylinder or with Card Reader. Request-to-Exit Switch (TS) shunts Door Position Switch during egress, preventing an alarm. Power Supply and Card Reader furnished by Security Contractor. Balance of Hardware by Aluminum Door Supplier. Note: Electrified Exit Device Trim requires a 4-1/2" wide Aluminum Stile Door.

**SET #24 -**

2	Spring Hinges	1001 6 X 4 1/2	26D	MC
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**SET #25 -**

4	Hinges	FBF179 4 1/2 X 4 1/2	US26D	ST
1	Deadlock	7T3-7L PATD	626	BE
1	Privacy Set	9K3-0L14D	626	BE
1	Kick Plate	KO050 10" x 34" B4E	630	TR
1	Mop Plate	KM050-1 4" x 35" B4E	630	TR
1	Wall Stop	1270WV	630	TR
1	Floor Stop	1214	626	TR
4	Door Silencers	1229A	GREY	TR

NOTE: Mount Deadbolt in Upper Leaf - Strike in Lower Leaf.

**SET #26 -**

2	Continuous Hinge	661 HD UL	AL	ST
1	Removable Mullion	KR822	689	PR
1	Exit Device	TS 2103 X 4903D CD	630	PR
1	Exit Device	TS 2102 X 4902D CD	630	PR
2	Mortise Cylinders	1E-74 PATD	626	BE
2	Rim Cylinders	12E-72 PATD	605	BE
2	Concealed Overhead Closers	BY ALUM DOOR MFG	689	BY
2	Floor Stops & Holders	1224	626	TR
1	Gasketing	5050 B		NA

**SET #27 -**

3	Spring Hinges	1001 6 X 4 1/2	26D	MC
1	Deadlock	8T3-7S PATD	630	BE
1	Edge Guard	KE38-1 36"	630	TR
2	Armor Plates	KA050-2 35" x 36" B4E C-SUNK HOLES	630	TR
2	Push Plates	1001-11	630	TR
2	Floor Stops X Holder	1224	626	TR

**SET #28 -**

3	Hinges	FBF191 4 1/2 X 4 1/2 NRP	US32D	ST
1	Exit Device	TS E2103 X 4908D CD	630	PR
1	Door Closer	CLD-4551 H-EDA	689	SD
1	Armor Plates	KA050-2 35" x 36" B4E C-SUNK HOLES	630	TR
1	Door Stop	1209	630	TR
1	Door Position Switch	1076D	BR	SENT
1	Power Transfer	PT1000	US28	AB
1	Card Reader	Furnished and installed per Section 28 13 00	BY VENDOR	
1	Drip Cap	16 A WOD + 4"		NA
1	Set of Weatherstripping	161 SA @ Head and Jambs		NA
1	Door Sweep	200 NA		NA
1	Saddle Threshold	425A 1/4-20 SSMSLA	AL	NA

NOTE: The Electrified Exterior Door Trim is locked unless energized - Fail Secure (FSE). Ingress is also by Keyed Cylinder or by Card Reader. Request-to-Exit Switch (TS) shunts Door Position Switch during egress, preventing an alarm. Power Supply and Card Reader furnished by Security Contractor. Balance of Hardware by Aluminum Door Supplier. Note: Electrified Exit Device Trim requires a 4-1/2" wide Aluminum Stile Door.

**SET #29 -**

3	Hinges	FBF191 4 1/2 X 4 1/2 NRP	US32D	ST
1	Exit Device	TS 2103 X 4903D CD	630	PR
1	Mortise Cylinder	1E-74 PATD	626	BE
1	Rim Cylinder	12E-72 PATD	605	BE
1	Door Closer	CLD-4551 EDA	689	SD
1	Kick Plate	KO050 10" x 34" B4E	630	TR
1	Door Stop	1209HO	630	TR
1	Door Position Switch	1076D	BR	SENT
1	Power Transfer	PT1000	US28	AB
1	Drip Cap	16 A WOD + 4"		NA
1	Set of Weatherstripping	161 SA @ Head and Jambs		NA
1	Door Sweep	200 NA		NA
1	Saddle Threshold	425A 1/4-20 SSMSLA	AL	NA

**SET #30 -**

2	Cylinders as Required	1E-74 PATD/12E72 PATD	626	BE
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NOTE: Balance of Door Hardware by Coiling Door Manufacturer.

**SET #31 -**

3	Hinges	FBF179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Storeroom Lock	9K3-7D14C PATD	626	BE
1	Armor Plate	KA050-2 35" x 36" B4E C-SUNK HOLES	630	TR
1	Floor Stop	1209	630	TR
3	Door Silencers	1229A	GREY	TR

**SET #32 -**

6	Hinges	FBF179 4 1/2 X 4 1/2 NRP	US26D	ST
2	Flush Bolts	3917-12	626	TR
1	Storeroom Lock	9K3-7D14C PATD	626	BE
2	Floor Stops	1209HO	630	TR
2	Dustproof Strike	3910	630	TR
2	Door Silencers	1229A	GREY	TR

**SET #33 -**

6	Hinges	FBF191 4 1/2 X 4 1/2 NRP	US32D	ST
2	Flush Bolts	3917-12	626	TR
1	Storeroom Lock	9K3-7D14C PATD	626	BE
2	Door Stops	1209HO	630	TR
2	Dustproof Strikes	3910	630	TR
2	Door Position Switches	1076D	BR	SENT
1	Drip Cap	16 A 4" ODW		NA
1	Set of Weatherstripping	161 SA @ Head and Jambs		NA
2	Door Sweeps	200 NA		NA
1	Saddle Threshold	425A 1/4-20 SSMSLA	AL	NA

**SET #34 -**

1	Continuous Hinge	661 HD UL X EPT Prep	AL	ST
1	Exit Device	TS E2103 X 4908D CD	630	PR
1	Mortise Cylinder	1E-74 PATD	626	BE
1	Rim Cylinder	12E-72 PATD	605	BE
1	Concealed Overhead Closer	BY ALUM DOOR MFG	689	BY
1	Door Stop	1209HO	630	TR
1	Door Position Switch	1076D	BR	SENT
1	Power Transfer	PT1000	US28	AB
1	Card Reader	Furnished and installed per Section 28 13 00	BY	VENDOR

NOTE: The Electrified Exterior Door Trim is locked unless energized - Fail Secure (FSE). Presentation of a Valid Credential to the Card Reader momentarily unlocks the trim, permitting ingress. Ingress is also by Keyed Cylinder. Request-to-Exit Switch (TS) shunts Door Position Switch during egress, preventing an alarm. Power Supply furnished by Security Contractor. Balance of Hardware by Aluminum Door Supplier. Note: Electrified Exit Device Trim requires a 4-1/2" wide Aluminum Stile Door.

**SET #35 -**

3	Hinges	FBF179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Classroom Lock	9K3-7R14C PATD	626	BE
1	Door Closer	CLD-4551 EDA	689	SD
1	Floor Stop & Holder	1224	626	TR
1	Gasketing	5050 B		NA

**SET #36 -**

NOTE: All Hardware by Operable Wall Manufacturer.

**SET #37 -**

3	Hinges	FBF179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Storeroom Lock	9K3-7D14C PATD	626	BE
1	Wall Stop	1270WV	630	TR
3	Door Silencers	1229A	GREY	TR

**SET #38 -**

2	Exit Devices	WTS 2103 X 4903A CD	630	PR
2	Mortise Cylinders	1E-74 PATD	626	BE
2	Rim Cylinders	12E-72 PATD	605	BE
2	Door Position Switches	1076D	BR	SENT

NOTE: Balance of Hardware by Gate Manufacturer.

**SET #39 -**

1	Exit Device	WTS 2103 X 4903A CD	630	PR
1	Rim Cylinder	12E-72 PATD	605	BE
1	Mortise Cylinder	1E-74 PATD C181	626	BE
1	Door Position Switch	1076D	BR	SENT

NOTE: Balance of Hardware by Gate Manufacturer.

**SET #40 -**

6	Heavy Duty Strap Hinges	CD1392	1D	STAN
1	Surface Bolt	3922L X MS	499	TR
1	Padlock	11B-722L PATD	626	BE
1	Cane Bolt	244B	622	TR

END OF SECTION 08 71 00

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SECTION 08 81 00 – GLASS GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Glass in the following locations:
  - 1. Aluminum and steel windows.
  - 2. Storefront systems.
  - 3. Exterior doors.
  - 4. Folding aluminum doors.
  - 5. Metal-framed skylights.
  - 6. Interior borrowed lites and interior doors.
  - 7. Canopies.
- B. Glass of the following types:
  - 1. Monolithic.
  - 2. Insulated.
  - 3. Laminated.
  - 4. Mirror glass.
  - 5. Translucent glass.

1.3 RELATED SECTIONS

- A. Section 05 70 00 – Decorative Metal: Installation of glazing in architectural canopies.
- B. Section 08 11 13 – Hollow Metal Doors and Frames.
- C. Section 08 14 16 – Flush Wood Doors.
- D. Section 08 41 13 – Aluminum-Framed Entrances and Storefronts: Installation of glazing and opaque panels in storefront system.
- E. Section 08 42 23 – Aluminum-Framed Folding Doors: Factory-installed glass in folding door system.
- F. Section 08 51 13 – Aluminum Windows.
- G. Section 08 63 00 – Metal Framed Skylights.

1.4 LEED REQUIREMENTS

- A. Refer to Section 01 35 13.20 for LEED requirements related to this Section.

1.5 DEFINITIONS

- A. Deterioration of Laminated Glass: Development of manufacturing defects including edge separation or delamination which materially obstructs vision through glass.
- B. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
- C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- D. Manufacturer: A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.
- E. **Sealed Insulating Glass Unit Surfaces: [Addendum 4]**
1. **Surface No. 1: Exterior surface of outer lite.**
  2. **Surface No. 2: Interior surface of outer lite.**
  3. **Surface No. 3: Exterior surface of inner lite.**
  4. **Surface No. 4: Interior surface of inner lite.**

1.6 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
1. Normal thermal movement is defined as that resulting from an ambient temperature range of 120-deg. F. and from a consequent temperature range within glass and glass framing members of 180-deg. F.
- B. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
  2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
  3. For laminated-glass lites, properties are based on products of construction indicated.
  4. Tempered Glass Coatings: Apply Low-E, frit, and other specified coatings to glass only after tempering to minimize quench pattern visibility.

- C. Provide mirrored glass that will not fail under normal usage. Failure includes glass breakage and deterioration attributable to defective manufacture, fabrication, and installation.

#### 1.7 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Shop Drawings: Show location of exterior glass units required to be heat strengthened based on glass stress analysis calculations.
- C. Samples for Verification:
  - 1. Glass: 12-inch-square samples of each type of glass indicated except for clear monolithic glass products,
  - 2. Sealant: 12-inch-long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative in color of the adjoining framing system.
- D. LEED Submittals: See Section 01 35 13.20 for additional requirements; provide the following:
  - 1. Product Data for Credit IEQ 4.1: For glazing sealants used inside of the weatherproofing system, including printed statement of VOC content.
- E. CALGreen Submittals: Provide product data for the following:
  - 1. Product Data for CALGreen 5.504.4.1 – Finish Material Pollutant Control; Adhesives, Sealants, and Caulks: For adhesives, sealants, and caulks, including printed statement of VOC content and chemical components.
- F. Glazing Schedule: Indicate glass types and thicknesses for each size opening and location. Use same designation indicated on the Drawings.

#### 1.8 INFORMATIONAL SUBMITTALS

- A. Product Certificates: Signed by glazing materials manufacturers certifying that their products comply with specified requirements.
  - 1. Separate certifications are not required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program of a recognized certification agency or independent testing agency acceptable to authorities having jurisdiction.
- B. Maintenance Data: For glass and other glazing materials to include in Operating and Maintenance Manual specified in Division 1.

1.9 QUALITY ASSURANCE

- A. Mockups: Before installing glazing, build mockups for each type of glass and finish, including canopies required to verify selections made under sample Submittals and to demonstrate aesthetic effects, quench pattern visibility both under natural viewing and polarized viewing conditions, and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
  - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
    - a. Use full size glass units to demonstrate fabrication techniques and quality.
  - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
  - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
  - 4. Obtain Architect's approval of mockups before starting glass fabrication.
  - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  - 6. Demolish and remove mockups when directed.
  - 7. Rejection: If strain pattern or any other pattern that is not intended or approved is visible to the naked eye, as judged solely by the Architect, the glass will be rejected.
- B. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that required for this Project, with a record of successful in-service performance.
- C. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. FGMA Publications: "FGMA Glazing Manual."
  - 2. LSGA Publications: "LSGA Design Guide."
  - 3. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
- D. Single-Source Responsibility for Glass: Obtain glass from one source for each product indicated below:
  - 1. Primary glass of each (ASTM C1036) type and class indicated.
  - 2. Heat-treated glass of each (ASTM C1048) condition indicated.
  - 3. Laminated glass of each (ASTM C1172) kind indicated.
  - 4. No visible strain pattern to the naked eye under various lighting conditions as judged solely by the Architect.
- E. Fabricator Qualifications: Shop that employs skilled, manufacturer-certified workers who custom fabricate glass similar to that required for this Project and whose products have a record of successful in-service performance.
- F. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction

1. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
  - G. Insulating Glass Certification Program: Provide insulating glass units permanently marked with appropriate Insulating Glass Certification Council (IGCC) certification label.
- 1.10 DELIVERY, STORAGE, AND HANDLING
- A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- 1.11 PROJECT CONDITIONS
- A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost, condensation, or other causes.
  - B. Install liquid sealants only when ambient and substrate temperatures are above 40 deg F (4.4 deg C).
- 1.12 WARRANTY
- A. Laminated Glass: Furnish written warranty signed by glass manufacturer, agreeing to furnish replacements for those laminated glass units which develop manufacturing defects as defined.
    1. Warranty Period: 5-years from date of Substantial Completion.
  - B. Insulating Glass: Furnish written warranty signed by glass manufacturer, agreeing to furnish replacements for those insulating glass units developing manufacturing defects as defined.
    1. Warranty Period: 10-years from date of Substantial Completion.
  - C. Mirror Glass: Furnish written warranty agreeing to furnish replacement mirrors for those units developing silver spoilage.
    1. Warranty Period: 15-years from date of Substantial Completion.
  - D. These warranties shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

## PART 2 - PRODUCTS

### 2.1 LEED MATERIAL REQUIREMENTS, GENERAL

- A. VOC Content: Sealants applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 35 13.20 - Sustainable Design Requirements.

1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## 2.2 PRIMARY FLOAT GLASS PRODUCTS

- A. Uncoated Clear Float Glass: ASTM C1036, Condition A (uncoated surfaces), Type I (transparent glass, flat), Quality q3 (glazing select), class and kind as indicated in schedule at the end of Part 3.
- B. Mirror Glass: ASTM C1503, Type I (transparent glass, flat), Class 1 (clear), and Quality q2 (mirror), with silvering, electro-plated copper coating, and protective organic coating, beveled edges.
- C. Laminated Glass: ASTM C1172; tempered, laminated, with polyvinyl butyral interlayer with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation kind as indicated in schedule at the end of Part 3.

## 2.3 HEAT-TREATED FLOAT GLASS

- A. Heat-Treated Float Glass: ASTM C1048, Type I (transparent glass, flat), Quality q3 (glazing select), class and kind as indicated in schedule at the end of Part 3.
- B. Safety Glass: ASTM C1048, fully tempered with horizontal tempering, Condition A uncoated, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select; conforming to ANSI Z97.1; thickness as indicated.

## 2.4 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E2190, and complying with other requirements specified.
  1. Basis-of-Design Product: The design for the insulated glass is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
  2. Basis-of-Design: PPG Industries, Inc.; Solarban 70XL. Refer to glazing schedule at end of this Section.
    - a. Guardian Industries.
    - b. Viracon.
  3. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
  4. Spacer: Thermally broken aluminum with black, color anodic finish or black powdered metal paint finish.
  5. Interspace: Air.
  6. Desiccant: Molecular sieve or silica gel, or blend of both.

## 2.5 ELASTOMERIC GLAZING SEALANTS

- A. Compatibility: Select glazing compounds and tapes of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
- B. Suitability: Comply with sealant and glass manufacturer's recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.
- C. Elastomeric Glazing Sealants: Comply with ASTM C920, Class A, and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates capable of water immersion without loss of properties; cured Shore A hardness of 15-25; color as selected.
  - 1. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Single-Component Neutral- and Basic-Curing Silicone Glazing Sealants:
    - a. Dow Corning Corporation; 999.
    - b. GE Silicones; SCS1200.
    - c. Tremco; Proglaze.

## 2.6 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent, non-staining and non-migrating in contact with nonporous surfaces, with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with ASTM C1281 and AAMA 800 for products indicated below:
  - 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
  - 2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

## 2.7 GLAZING GASKETS

- A. Dense Elastomeric Compression Seal Gaskets: Molded or extruded neoprene, EPDM, or silicone gaskets of profile and hardness required to maintain watertight seal; complying with ASTM C864, D.S. Brown Co., Maloney, Tremco or approved equal.
- B. Soft Compression Gaskets: Extruded or molded closed cell, integral-skinned neoprene, EPDM, or silicone of profile and hardness required to maintain watertight seal; complying with ASTM C509, Type II, black; D.S. Brown Co., Maloney, Tremco or approved equal.

2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
- C. Glazing Stops: Screw applied or snap on type (beads) coordinated with glass section indicated, finished to complement exterior window finish.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Mirror Mastic: Adhesive setting compound manufactured specifically for setting mirrors on wall with support channel at bottom edge.
  - 1. VOC Content: Not more than 70 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- F. Extruded-Aluminum Mirror Top and Bottom Trim: J-channels formed with a return deep enough to produce a glazing channel to accommodate mirrored glass units of thickness indicated and in lengths required to cover top and bottom edge of each mirrored glass unit in a single piece.

2.9 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Pre-Glazed Units: Fabricate glass and other glazing products in sizes required to preglaze units at the factory, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.
- B. Field-Glazed Units: Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.
- C. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with inside and outdoor faces.
  - 1. Grind smooth and polish exposed glass edges.

2.10 GLASS CANOPY FABRICATION

- A. Field verify dimensions prior to fabricating glass canopy components. **See also Section 05 70 00. [Addendum 4]**
- B. Fit and assemble canopies in shop to greatest extent possible.



- C. Fabricate free of visual distortion and defects. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- D. Prepare components to receive anchor devices. Fabricate anchors.
- E. Arrange fasteners and attachments to ensure concealment from view.
- A. Fabricate to drain water entering joints, condensation, and migrating moisture occurring within unit.
- B. Fabricate glass and other glazing products in sizes required to glaze canopies indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.
- C. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with inside and outdoor faces.
  - 1. Grind smooth and polish exposed glass edges.

## 2.11 MIRROR FABRICATION

- A. Mirror Sizes: To suit Project conditions, and before tempering, cut mirrors to final sizes and shapes.
  - 1. Fabricate mirrors in single piece wherever possible.
  - 2. Where mirror length exceeds practical shipping and installation limits, follow seam pattern indicated on Drawings.
  - 3. Fabricate adjoining mirror units to be installed with hairline seams.
- B. Cutouts: Fabricate cutouts before tempering for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.
- C. Mirror Edge Treatment: Flat polished.
  - 1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
  - 2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine glass framing, with glazier present, for compliance with the following:
  - 1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
  - 2. Presence and functioning of weep system.
  - 3. Minimum required face or edge clearances.
  - 4. Effective sealing between joints of glass-framing members.

- B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

### 3.3 GLAZING, GENERAL

- A. General: Watertight and airtight installation of each piece of glass exposed to the weather is required. Each installation must withstand normal temperature changes, wind loading, and impact loading with no failure of any kind, including loss or breakage of glass, failure of sealants or gasketing to remain air and water tight, deterioration of glazing materials or other defects in the materials or their application.
- B. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- C. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- D. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- E. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- F. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- G. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- H. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- I. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

- J. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- K. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- L. Comply with manufacturer's specifications and recommendations for installation of glazing in window units.
- M. Do not allow sealants to come in contact with edges of laminated glass units.

#### 3.4 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

#### 3.5 CANOPY GLAZING

- A. Protect adjacent surfaces sealants and glazing materials with masking tape or other means.  
**See also Section 05 70 00. [Addendum 4]**
- B. Install setting blocks and spacers as recommended by canopy manufacturer and indicated on approved shop drawings.
  - 1. Place setting blocks at quarter points. Maintain spacings indicated on Drawings.
  - 2. Set blocks in sealant.
- C. Provide edge blocking as required to prevent sideways movement of glass in glazing channel.
- D. Ensure glazing channels and stops provide required bite on glass, minimum edge and face clearances, and adequate sealant thickness.
- E. Gasket Glazing:
  - 1. Fabricate two piece compression gaskets to exactly fit openings.
  - 2. Install soft compression gasket against permanent stops. Miter cut and bond together corners.
  - 3. Rest glass on setting blocks. Insert dense compression gasket to press glass against soft gasket and lock in place against removable stop.
  - 4. Apply sealant to gasket joints.
  - 5. Install gaskets to protrude slightly beyond glazing stops.

3.6 MIRROR INSTALLATION

- A. Securely fasten chrome j-mold directly above backsplash of countertops. Clean j-mold and remove any construction debris before installing mirror glass.
- B. Affix mirror glass to interior walls where indicated on Drawings using specified mastic.
- C. Apply a bead of clear silicone sealant to space between mirror glass and j-mold to create a seal against water penetration from adjacent plumbing fixtures.

3.7 CLEANING AND PROTECTION

- A. Construction Waste Management: Manage construction waste in accordance with provisions of Section [ADDENDUM 3] 01 35 13.26 Construction Waste Management. Submit documentation for Credit MR 2 to satisfy the requirements of that Section.
- B. Examine glass surfaces adjacent to or below exterior concrete at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.
- C. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, during construction period, including natural causes, accidents and vandalism.
- D. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass using non-abrasive soft cloths as recommended by glass manufacturer.
- E. Protect exterior glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- F. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

3.8 GLAZING SCHEDULE

- A. Insulating Glass, PPG Industries, Inc.:
  - 1. Product: Solarban 70XL (GL-1, GL-7):
  - 2. Inside Lite: Type 1 (transparent glass, flat) float glass, Class 1 (clear), 1/4 inch thick, Kind HS (heat strengthened), Condition A (uncoated surfaces) or Kind FT (fully tempered), Condition A (uncoated surfaces) as required.
    - a. Color: Clear.
  - 3. Interspace Content and Thickness: Air, 1/2 inch thick space.
  - 4. Outside Lite: Type I (transparent glass, flat) float glass, Class 1 (clear), 1/4 inch thick, Kind HS (heat strengthened), Condition C (other coated glass) or Kind FT (fully tempered), Condition C (other coated glass) as required.
    - a. Color: Clear, low-E coating on number 2 surface.

5. Visible Light Transmittance: 64 percent.
  6. Shading Coefficient: 0.32.
  7. Solar Heat Gain Coefficient: 0.27.
  8. Winter Nighttime U Value: 0.28.
  9. Summer Daytime U-Value: 0.26.
  10. LSG Ratio: 2.37.
- B. Insulated/Laminated Translucent System (GL-2): Not used.
- C. Insulated/Laminated Metal Framed Skylight System (GL-3):
1. Product: PPG Solarban 100 T/LAM IG.
  2. Inside Lite:
    - a. Overall Thickness: 5/16-inch (8 mm) thick.
    - b. Class 1 (clear), uncoated, Kind LA consisting of two lites of annealed float glass.
      - 1) Outer Lite: Class 1 (clear) float glass.
        - a) Thickness: 3.0 mm.
      - 2) Plastic Interlayer:
        - a) Thickness: 0.030 inch (0.76 mm), but not less than that required to comply as a Type II safety glass material.
        - b) Interlayer Color: White.
      - 3) Inner Lite: Class 1 (clear) float glass.
        - a) Thickness: 3.0 mm.
      - 4) Acid etch on No. 3 surface
  3. Interspace Content and Thickness: Air, 1/2 inch thick space.
  4. Outside Lite: Type I (transparent glass, flat) float glass, Class 1 (clear), 1/4 inch thick, Kind HS (heat strengthened), Condition C (other coated glass) or Kind FT (fully tempered), Condition C (other coated glass) as required.
    - a. Color: Clear, low-E coating on number 2 surface.
  5. Visible Light Transmittance: ~~42~~ **[Addendum 4] min 50** percent.
  6. Shading Coefficient: 0.27.
  7. Solar Heat Gain Coefficient: 0.23.
  8. U Value: 0.29.
- D. Interior Glass in Doors and Window Frames (GL-4):
1. Thickness: 1/4 inch thick.
  2. Class 1 (clear), uncoated.
  3. Kind: FT (fully tempered).
- E. Mirror (GL-5):
1. Thickness: 1/4 inch thick, of dimensions indicated on Drawings.
  2. Tempered or heat-strengthened as required.
- F. Canopy Glass (GL-6): **See Section 05 70 00 [Addendum 4]**
- ~~1. Overall Thickness: 5/16-inch (8 mm) thick. [Addendum 4]~~
  - ~~2. Class 1 (clear), uncoated, Kind LA consisting of two lites of annealed float glass.~~
    - ~~a. Outer Lite: Class 1 (clear) float glass.~~
      - ~~1) Thickness: 3.0 mm.~~

- b. ~~Plastic Interlayer:~~
  - 1) ~~Thickness: 0.030 inch (0.76 mm), but not less than that required to comply as a Type II safety glass material.~~
  - 2) ~~Interlayer Color: White.~~
- c. ~~Inner Lite: Class 1 (clear) float glass.~~
  - 1) ~~Thickness: 3.0 mm.~~

G. Deductive Alternate No. 2 (GL-8):

- 1. Provide same product as GL-1, with 1/8-inch ceramic dot frit on ~~1-side~~ **number 2 surface [Addendum 4]**.

END OF SECTION 08 81 00

SECTION 09 51 23 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Acoustical tile ceilings.
- B. Suspended metal grid ceiling system and perimeter trim.

1.3 RELATED SECTIONS

- A. Section 09 29 00 – Gypsum Board: Suspended gypsum board ceilings.
- ~~B. Section 09 51 13 – Acoustical Panel Ceilings: Large format ceiling panel systems.~~  
[Addendum 4]
- C. Section 09 51 26 – Acoustical Wood Ceilings.
- D. Division 21: Sprinkler heads in acoustical ceilings.
- E. Division 23: Grilles, registers, and diffusers in acoustical ceilings.
- F. Division 26: Lighting fixtures in acoustical ceilings.

1.4 LEED REQUIREMENTS

- A. Refer to Section 01 35 13.20 for LEED requirements related to this Section.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, including the following:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
  - 4. Ceiling suspension members.
- B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
  - 1. Ceiling suspension system members.
  - 2. Method of attaching hangers to building structure.

3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- C. Shop Drawings: Submit reflected ceiling plans on which the following items are shown and coordinated with each other for the fabrication and installation of the Work, based on input from installers of the items involved for Architect's action.
1. Layout of suspension systems, location of hangers, seismic braces and trapezes.
  2. Hanger spacing and fastening details.
  3. Trapeze details.
  4. Splicing method for main and cross runners.
  5. Method of attaching hangers to building structure.
  6. Support at ceiling fixtures and air diffusers.
  7. Change in level details.
  8. Locations and dimensions of access panels, light fixtures, supply and exhaust grilles and diffusers, sprinkler heads, speakers, and detection devices.
  9. Seismic control details.
  10. Develop and coordinate location of all Work which is to be located in ceiling with the Sections involved per Section 01 33 00 prior to making shop drawing submittal.
- D. Samples for Verification: Submit samples of each type of exposed finish required, prepared on samples of size indicated below and of same thickness and material indicated for final unit of Work.
1. Furnish sufficient samples to establish full range of colors and textures for materials exposed in the finished Work. Label samples to indicate product and location in the Work. Samples will be reviewed for appearance only. Compliance with other requirements is the responsibility of the Contractor.
  2. Ceiling Tiles: Samples of each acoustical tile type, pattern, and color; ~~12" x 24"~~ **[Addendum 4] 6" x 6"** minimum.
  3. Set of 12-inch-long samples of suspension system members.
- E. LEED Submittals: See Section 01 35 13.20 for additional requirements; provide the following:
1. Product Data for Credit EA 1: Show values which demonstrate a percentage improvement in the proposed building performance rating compared to the baseline building performance rating per ASHRAE/IESNA Standard 90.1-2004.
  2. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
    - a. Include statement indicating costs for each product having recycled content.
  3. Product Data for Credit IEQ 3.1 and Credit IEQ 3.2: Indicate methods to be used for ensuring a reduction of indoor air quality problems in order to help sustain the comfort and well-being of construction workers and building occupants.
  4. Product Data for Credit IEQ 4.1: For sealants, including printed statement of VOC content.
- F. CALGreen Submittals: Provide product data for the following:
1. For CALGreen 5.504.4.1 – Finish Material Pollutant Control; Adhesives, Sealants, and Caulks: For adhesives, sealants, and caulks, including printed statement of VOC content.



**1.6 INFORMATIONAL SUBMITTALS**

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical tile ceiling.
- B. Research/Evaluation Reports: For each acoustical tile ceiling and components and anchor and fastener type.
- C. Maintenance Data: For finishes to include in maintenance manuals.

**1.7 MAINTENANCE MATERIAL SUBMITTALS**

- A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with appropriate labels.
  - 1. Ceiling Units: Furnish quantity of full-size units equal to 2.0 percent of amount installed.
  - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.

**1.8 QUALITY ASSURANCE**

- A. Source Limitations: Obtain each type of acoustical ceiling tile and supporting suspension system through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide acoustical tile ceilings that comply with the following requirements:
  - 1. Surface-Burning Characteristics: Provide acoustical tiles with the following surface-burning characteristics complying with ASTM E1264 for Class A materials as determined by testing identical products per ASTM E84:
    - a. Smoke-Developed Index: 450 or less.
- C. Seismic Standard: Provide acoustical tile ceilings designed and installed to withstand the effects of earthquake motions according to requirements of authorities having jurisdiction.

**1.9 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

**1.10 PROJECT CONDITIONS**

- A. Install acoustical units after interior wet work is dry.

## PART 2 - PRODUCTS

### 2.1 LEED MATERIAL REQUIREMENTS, GENERAL

- A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. VOC Content: Sealants applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 35 13.20 - Sustainable Design Requirements.
  - 1. Use materials that have the minimum VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

### 2.2 MATERIALS

- A. Ceiling Tile (ACT-1): Armstrong World Industries, Inc.
  - 1. Accepted equivalent.
  - 2. Item Number: As indicated on Drawings.
  - 3. Classification: Type IV, Form 2, Pattern E.
  - 4. Size: As indicated on Drawings.
  - 5. Thickness: As indicated on Drawings.
  - 6. Composition: Wet-formed mineral fiber.
  - 7. Acoustics NRC: 0.75.
  - 8. CAC: 35.
  - 9. Edge: Beveled tegular lay-in.
  - 10. Surface Color: As indicated on Drawings.
  - 11. Surface Finish: Factory-applied latex paint.
  - 12. Grid Width: As indicated on Drawings.
- B. Ceiling Tile (ACT-2): Armstrong World Industries, Inc.
  - 1. Item Number: As indicated on Drawings.
  - 2. Classification: Type IV, Form 2, Pattern E
  - 3. Size: As indicated on Drawings.
  - 4. Thickness: As indicated on Drawings.
  - 5. Composition: Wet-formed mineral fiber.
  - 6. Acoustics NRC: NA.
  - 7. CAC: 40.
  - 8. Edge: Square lay-in.
  - 9. Surface Color: As indicated on Drawings.
  - 10. Surface Finish: Vinyl-faced membrane.
  - 11. Grid Width: As indicated on Drawings.
- C. **[Addendum 4] Ceiling Tile (ACT-3): Armstrong World Industries, Inc.**
  - 1. **Item Number: As indicated on Drawings.**
  - 2. **Classification: Type XII, Form 2, Pattern E**
  - 3. **Size: As indicated on Drawings.**
  - 4. **Thickness: As indicated on Drawings.**
  - 5. **Composition: Wet-formed mineral fiber.**
  - 6. **Acoustics NRC: 0.95**

7. **CAC: 42.**
8. **Edge: Square lay-in.**
9. **Surface Color: As indicated on Drawings.**
10. **Surface Finish: : Factory-applied latex paint.**
11. **Grid Width: As indicated on Drawings.**

## 2.3 SUSPENSION SYSTEM COMPONENTS

- A. Suspension System: ASTM C635, Armstrong World Industries, Inc.
  1. Seismic Category: DEF
  2. Exposed Grid Surface Width: As indicated on Drawings.
    - a. Main Runners: 1-11/16-inch high, double web construction.
    - b. Cross Runners: Double web construction.
    - c. **Grid ASTM Class: Heavy-duty.**
  3. Finish: As indicated on Drawings.
  4. Wall Angle, Reveals, and Miscellaneous Trim: Roll-formed from electro-galvanized steel strip to profiles indicated.
  5. **At Sloped Ceilings:**
    - a. **Perimeter Support Wires 8-inches or less from wall are required.**
    - b. **Wall Clearance: 3/4-inch.**
    - c. **Minimum Wall Molding Width: 2" or 7/8" with BERC2 Clip.**
    - d. **Fastener Perimeter Tee Connections: Required.**
    - e. **Lateral Force Bracing (splay wires/rigid bracing) for Ceiling Areas > 1,000 ft2: Required.**
    - f. **Compression Posts for Ceiling Areas > 1,000 ft2: Required.**
- B. Attachment Devices: Size for 5 times design load indicated in ASTM C635, Table 1, Direct Hung, double web, Intermediate-Duty System, unless otherwise indicated.
- C. Wire for Hangers and Ties: ASTM A641, Class 1 zinc coating, soft temper.
  1. Gage: Provide wire sized so that stress at 3 times hanger design load (ASTM C635, Table 1, Direct-Hung) will be less than yield stress of wire, but provide not less than 0.106-inch diameter (12-gage).
- D. Support Hangers and Channels: Mild steel, zinc coated, or protected with rust-inhibitive paint, size and shape to suit application and seismic requirements.
  1. Hanger Wires: Connection device capable of carrying not less than 100-pounds.
  2. Bracing Wires: Connection device capable of carrying not less than 200-pounds or the actual design load, whichever is greater, with a safety factor of 2 without yielding.
- E. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
  1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.

2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
- F. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- G. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical tiles in-place.
- H. Hold-Down Clips **[Addendum 4] and Wall Moldings:** Armstrong World Industries, Inc., BERC2; where indicated, provide manufacturer's standard hold-down clips spaced 24-inches (610 mm) oc on all cross tees.

## 2.4 ACOUSTICAL SEALANT

- A. Acceptable Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  1. Acoustical Sealant for Exposed and Concealed Joints:
    - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
    - b. USG Corporation; SHEETROCK Acoustical Sealant.
  2. Acoustical Sealant for Concealed Joints:
    - a. OSI Sealants, Inc.; Pro-Series SC-175 Rubber Base Sound Sealant.
    - b. Pecora Corporation; BA-98.
    - c. Tremco, Inc.; Tremco Acoustical Sealant.
- B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), complying with ASTM C834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
- C. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), recommended for sealing interior concealed joints to reduce airborne sound transmission.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and structural framing to which ceiling system attaches or abuts, with Installer present, for compliance with requirements specified in this and other sections that affect installation and anchorage of ceiling system.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half-width units at borders, and comply with reflected ceiling plans.

3.3 INSTALLATION, GENERAL

- A. General: Install acoustical panel ceilings to comply with seismic design requirements indicated, in accordance with manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Standard for Installation of Ceiling Suspension Systems: Comply with ASTM C636.
- C. Arrange acoustical units and orient directionally patterned units (if any) in manner shown by reflected ceiling plans.

3.4 INSTALLATION, SUSPENSION SYSTEM

- A. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system.
- B. Splay hangers only where required, to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
- C. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- D. Secure wire hangers to ceiling suspension members and to supports above with a minimum of four tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
- E. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
- F. Space hangers not more than 48-inches oc along each member supported directly from hangers, unless otherwise shown, and provide hangers not more than 8-inches from ends of each member.
- G. Ceiling grid members shall be attached to not more than 2 adjacent walls in accordance with ASCE 7, Section 13.5.6.2(b). Ceiling grid members shall be at least 3/8-inch and not more than 3/4-inch free of other walls. If walls run diagonally to ceiling grid system runners, one end of main and cross runners shall be free, and a minimum of 3/4-inch clear of wall.
- H. The width of the perimeter supporting closure angle shall be not less than 7/8-inch.

- I. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, kinked or otherwise damaged runners.
- J. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.
- K. Provide expansion joints in the ceiling at intersections of corridors and at junctions of corridors with lobbies or other areas.
- L. Provide lateral-force bracing assemblies consisting of a compression strut and four 12-gauge splayed bracing wires oriented 90-degrees from each other at the following spaces:
  - 1. Place sets of bracing wires spaced not more than 12-feet by 12-feet on center.
  - 2. Provide bracing wires at locations not more than 1/2 the specified spacing from each perimeter wall and at the edge of vertical ceiling offsets.
  - 3. The slope of these wires shall not exceed 45-degrees from the plane of the ceiling and shall be taut without causing the ceiling to lift. Splices in bracing wires are not permitted.
  - 4. Compression struts shall not be more than 1 (horizontal) in 6 (vertical) out of plumb.
- M. Provide seismic separation joints for ceiling areas greater than 2,500-square feet.
- N. Support of Light Fixtures and Air Terminals: Comply with ASTM C635.
  - 1. Ceiling suspension systems that support light fixtures, air-ventilation grilles or partitions shall have a classification of heavy-duty.
  - 2. Recessed or drop-in light fixtures and grilles shall be supported directly from the fixture housing to the structure above with a minimum of two 12-gauge wires located at diagonally opposite corners. Fixture support wires may be slightly loose to allow the fixture to seat in the grid system.
  - 3. Fixture shall not be supported from main runners or cross runners if the weight of the fixtures causes the total dead load to exceed the deflection capability of the ceiling suspension system.
- O. Perimeter Trim:
  - 1. Provide in longest lengths available and combinations of lengths to minimize number of joints required.
  - 2. Do not use pieces shorter than 48-inches.
  - 3. Miter joints at corners.
  - 4. Install to neatly close with adjoining vertical surfaces.

### **3.5 SLOPED CEILING INSTALLATION [ADDENDUM 4]**

- A. **Level main suspended ceiling beams to within 1/4" in 10'-0".**
- B. **Maximum ceiling slope angle shall not exceed 30 degrees.**
- C. **Install hanger wires vertically and plumb. If lateral force bracing is required in severe seismic areas, it shall remain vertical and the splay wires shall be installed at maximum 45° to the horizontal.**

- D. Install ceiling panels with Maximum Hold Down Clips following manufacturer's written instructions.
- E. Install main beams parallel (up/down the incline) the slope. **DO NOT INSTALL MAIN BEAMS PERPENDICULAR TO THE SLOPE AS THIS MAY RESULT IN SUSPENSION SYSTEM FAILURE.**
- F. Space main beams at 4'-0" oc, maximum.
- G. If I-beams, joists, or trusses are running up the slope and do not have purlins between them, bridge the beams, joists, or trusses with a material capable of supporting the ceiling system load
- H. Place shims between panel edge and web of cross tees at the lower edge of each panel to center the panel in the suspension system opening.
- I. At Ceiling Perimeter: Wall shim with 7/8" Item 7800 Wall Angle kept at 90° and BERC2 Clip with positive cross tee attachment on adjacent attached walls.

### 3.6 INSTALLATION OF ACOUSTICAL SEALANT

- A. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
- B. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
- C. Screw attach moldings to substrate at intervals not more than 16-inches (400 mm) oc and not more than 3-inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8-inch in 12-feet (3.2 mm in 3.66 m). Miter corners accurately and connect securely.
- D. Do not use exposed fasteners, including pop rivets, on moldings and trim.

### 3.7 INSTALLATION, CEILING TILES

- A. Install units after above-ceiling work is complete.
- B. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
- C. Install acoustical tile in coordination with suspension system and exposed moldings and trim. Place splines or suspension system flanges into kerfed edges so that every tile-to-tile joint is closed by double lap of material.
- D. Install acoustical units level, in uniform plane, and free from twist, warp and dents.
- E. Arrange directionally patterned acoustical tiles as follows:
  - 1. As indicated on reflected ceiling plans.

- F. Fit adjoining tile to form flush, tight joints and to fit irregular grid and perimeter edge trim. Scribe and cut for accurate fit at borders and around penetrating work.
- G. Trim cut tiles at wall junctures so that tegular edges fit properly into grid and edge moldings. Trim edges of tegular tiles to match edges on untrimmed sides as indicated on Drawings. Paint cut edges to match ceiling tile face.
- H. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.
- I. Conform to State safety orders and applicable codes, including the seismic bracing requirements of CBC.

### 3.8 CLEANING

- A. Construction Waste Management: Manage construction waste in accordance with provisions of Section [ADDENDUM 3] 01 35 13.26 Construction Waste Management. Submit documentation for Credit MR 2 to satisfy the requirements of that Section.
- B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage.
- C. Adjust hangers as required. Addition of kinks or bends in hanger are not acceptable; take up in ties only.
- D. When complete, grid members of each assembly shall be mutually parallel/square, accurately aligned, with joints neatly formed and closely fitted and aligned flush; each assembly shall be securely anchored and braced to structure to prevent movement.
- E. Exposed surfaces of grids shall be clean and free from scratches, dents, tool marks, stains, discoloration, fingerprints, and other defects and damage.
- F. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 23



SECTION 09 65 00 - RESILIENT FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Resilient flooring of the following types:
  - 1. Luxury vinyl plank flooring.
  - 2. Fitness flooring.
  - ~~3. Linoleum sheet floor coverings.~~
  - 3. **[Addendum 4] Linoleum tile flooring.**
  - 4. Resilient wall base, reducer strips, and other accessories.

1.3 LEED REQUIREMENTS

- A. Refer to Section 01 35 13.20 for LEED requirements related to this Section.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product specified.
  - 1. Provide manufacturers' product data for adhesives, including printed statement of VOC content.
- B. Shop Drawings:
  - 1. Show locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
  - 2. Show details of special patterns.
- C. Samples for Verification:
  - 1. ~~Linoleum Sheet Flooring: In manufacturer's standard size, but not less than 6 by 9-inch (150 by 230 mm) sections of each color and pattern of linoleum floor covering required. [Addendum 4]~~
  - 1. **[Addendum 4] Linoleum Tile: In manufacturer's standard size, but not less than 12-inches (300-mm) square samples of each different color and pattern of floor covering required.**
  - 2. Heat-Welding Bead: Include manufacturer's standard-size Samples, but not less than 9 inches (230 mm) long, of each color required.
  - 3. Resilient Wall Base: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches (300 mm) long, of each resilient product color, texture, and pattern required.
  - 4. **[Addendum 4] Resilient Accessories: For each type of product indicated, in manufacturer's standard-size.**

- D. ~~Heat-Welded Seam Samples: For each flooring product and welding bead color and pattern combination required; with seam running lengthwise and in center of 6-by-9-inch (150-by-230-mm) Sample applied to rigid backing and prepared by Installer for this Project.~~  
**[Addendum 4]**
- E. LEED Submittals: See Section 01 35 13.20 for additional requirements; provide the following:
  - 1. Product Data for Credit IEQ 4.1: For flooring installation adhesives, including printed statement of VOC content.
  - 2. Product Data for Credit IEQ 4.3: For low emitting flooring materials, including printed statement of VOC content and chemical components.
- F. CALGreen Submittals: Provide product data for the following:
  - 1. For CALGreen 5.504.4.1 – Finish Material Pollutant Control; Adhesives, Sealants, and Caulks: For adhesives, sealants, and caulks, including printed statement of VOC content.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For linoleum floor coverings to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.
  - ~~1. Sheet Floor Covering: Furnish not less than 10 linear feet (3 linear m) in full roll width for every 500 linear feet (150 linear m) or fraction thereof, in roll form and in full roll width, of each different type, color, and pattern of sheet floor covering installed.~~**[Addendum 4]**
  - 1. **[Addendum 4] Floor Tile and Planks: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile and floor plank installed.**
  - 2. Resilient Base Material: 50 lineal feet of each color and size.
  - 3. **[Addendum 4] Resilient Accessory Material: 50 lineal feet of each color and size.**

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are approved and certified by flooring manufacturer, as well as competent in techniques required by manufacturer for floor covering installation and seaming method indicated.

- B. Single-Source Responsibility for Resilient Flooring and Wall Base: Obtain each type, color, and pattern of resilient flooring and wall base from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- C. Fire Performance Characteristics: Provide resilient flooring and wall base with the following fire performance characteristics as determined by testing products per ASTM test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Critical Radiant Flux: 0.45 watts per sq cm or more per ASTM E648.
  - 2. Smoke Density: Less than 450 per ASTM E662.
- D. Mockups: Install mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
  - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Low Emitting Materials: Provide resilient flooring and wall base installed on the interior of the building that meets the testing and product requirements for certification by RFCI FloorScore.

**1.9 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver resilient flooring and wall base and installation accessories to Project site in original manufacturer's unopened cartons and containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Store resilient flooring and wall base materials in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F (10 deg C) and 90 deg F (32 deg C).
- C. Move resilient flooring and wall base and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

**1.10 PROJECT CONDITIONS**

- A. Maintain a minimum temperature of 70 deg F (21 deg C) in spaces to receive resilient flooring and wall base for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F (13 deg C).
- B. Do not install flooring and wall base until material is at the same temperature as the space where it is to be installed.
- C. Close spaces to traffic during installation.
- D. Close spaces to traffic for 48 hours after resilient wall base installation.
- E. Install resilient products after other finishing operations, including painting, have been completed.

1.11 SEQUENCING AND SCHEDULING

- A. Install resilient products after other finishing operations, including flooring installation and painting, have been completed.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS, GENERAL

- A. VOC Content: Adhesives applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 35 13.20 - Sustainable Design Requirements.
  - 1. Use materials that have the minimum VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Low Emitting Materials: Provide resilient products installed on the interior of the building that meet the testing and product requirements for certification by RFCI FloorScore.

2.2 LUXURY VINYL PLANK FLOORING

- A. Luxury Vinyl Tile: ASTM F1700; Class III, Type B
  - 1. Product: As indicated on Drawings.
  - 2. Product Number: As indicated on Drawings.
  - 3. Gauge: As indicated on Drawings.
  - 4. Size: As indicated on Drawings
  - 5. Style and Color: As indicated on Drawings.

2.3 FITNESS FLOORING

- A. Sheet Vinyl Floor Covering with Backing, ASTM F1303; Type 1, Grade 1, Class C
  - 1. Product: As indicated on Drawings.
  - 2. Flexibility, ASTM F137; Pass
  - 3. Hardness, ASTM D2240; 90
  - 4. James Machine, SCOF, ASTM D2047; Neolite: 0.93, Neolite w/ Finish: 0.98
  - 5. Abrasion Resistance, ASTM D3884; 0.23%, 1,000 cycles
  - 6. Static Load (max 0.005"), ASTM F970; 450 psi
  - 7. Short-term Indentation, ASTM F1914; 0.002" residual indentation @ 75 lbs.
  - 8. Castor Chair Test, ISO TR4918; 25,000 cycles - Wear: 4.3, Color: 4.0, Change: 4.4
  - 9. Dimensional Stability, ASTM F2199; 0.07% loss
  - 10. Heat Stability, ASTM F1514; Pass
  - 11. Light Stability, ASTM F1515; Pass
  - 12. Critical Radiant Flux, ASTM E648; Class 1  $\geq 0.45$  watts/cm<sup>2</sup>
  - 13. Chemical Resistance, ASTM F925; No Change
  - 14. Seams: Heat welded.

## 2.4 LINOLEUM SHEET FLOORING

- A. ~~Basis-of-Design Product: The design for the linoleum flooring is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:~~
- ~~1. Basis-of-Design: Forbo Industries, Inc.; Marmoleum—Real.~~
  - ~~2. Armstrong World Industries, Inc.~~
  - ~~3. Azrock Commercial Flooring, DOMCO.~~
  - ~~4. Accepted equivalent.~~
- B. ~~Sheet Floor Covering: ASTM F2034.~~
- ~~1. Roll Size: In manufacturer's standard length by not less than 78 inches (1980 mm) wide.~~
  - ~~2. Colors and Patterns: To be selected.~~
  - ~~3. Seaming Method: Heat welded.~~
  - ~~4. Thickness: 0.10 inch (2.5 mm) minimum.~~
  - ~~5. Fire Test Response Characteristics:~~
    - ~~a. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E648.~~

## 2.4 LINOLEUM TILE FLOORING

- A. [Addendum 4] Tile: ASTM F2195; homogeneous linoleum floor tile of primarily natural materials consisting of linseed oil, wood flour, and rosin binders, mixed and calendered onto natural jute backing, with pattern and color extending throughout total thickness of material.
1. Basis-of-Design: Forbo Industries, Inc.; Marmoleum – Modular.
  2. Accepted equivalent.
  3. Dimensions: To be determined.
  4. Thickness: 1/10-inch.
  5. Type:
    - a. Type I: Linoleum floor tile with fibrous backing;
    - b. Type II: Linoleum floor tile with special backing;
    - c. Type III: Linoleum floor tile without backing; and
    - d. Type IV: Static dissipative linoleum floor tile with or without backing.
  6. Slip Resistance: In accordance with ADA recommendation of .6 for flat surfaces.
  7. Static Load Limit: ASTM F970, 450 lb/sq in.
  8. Fire Resistance
    - a. Smoke Density: ASTM E622, 450 or less.
    - b. Critical Radiant Flux: ASTM E648, Class 1.
  9. Style and Color: As indicated on Drawings.

## 2.5 RUBBER BASE

- A. Resilient Wall Base: ASTM F1861, Type TS (rubber, vulcanized thermoset).
1. Manufacturers:
    - a. Basis-of-Design: Burke. [Addendum 4] Johnson/Tarkett
    - b. Armstrong World Industries, Inc.
    - c. Roppe.

- d. Accepted equivalent.
2. Manufacturing Method: Group I (solid, homogeneous).
3. Style: Cove (with top-set toe).
4. Minimum Thickness: 0.125-inch (3.2 mm).
5. Height: 4-inches (102 mm).
6. Lengths: Coils in manufacturer's standard length, but not less than 100 feet.
7. Outside Corners: Premolded.
8. Inside Corners: Premolded.
9. Surface: Smooth.
10. Color and Finish: As selected by Architect from manufacturer's full range.

## 2.6 RESILIENT MOLDING ACCESSORIES

- A. Resilient Molding Accessory:
  1. Acceptable Manufacturers: Subject to compliance with requirements, acceptable manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
    - b. Johnsonite.
    - c. Roppe Corporation, USA.
- B. Description:
  1. Carpet edge for glue-down applications.
  2. Reducer strips for carpet insets.
  3. Transition strips from linoleum to carpet.
  4. Material: Vinyl.
  5. Profile and Dimensions: As indicated.
  6. Colors: As selected by Architect from full range of industry colors.

## 2.7 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by floor covering manufacturer for applications indicated.
- B. Adhesives (Cements): Water-resistant type recommended by resilient wall base manufacturer to suit resilient products and substrate conditions indicated.
  1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24 and South Coast Air Quality Management District Rule #1168).
    - a. Linoleum Flooring Adhesives: Not more than 60 g/L.
    - b. Base Adhesives: 50 g/L.
- C. Heat-Welding Bead: Solid-strand product of floor covering manufacturer.
  1. Color: Match floor covering.
- D. ~~Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.~~ [Addendum 4]

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. General: Examine areas where installation of resilient products will occur, with Installer present, to verify that substrates and comply with manufacturer's requirements and those specified in this Section.
- B. Examine substrates for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor coverings.
  - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. General: Comply with manufacturer's installation specifications to prepare substrates indicated to receive resilient wall base.
- B. Use trowelable leveling and patching compounds per manufacturer's directions to fill cracks, holes, and depressions in substrates.
- C. Concrete Substrates: Prepare according to ASTM F710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
  - 3. Moisture and Alkalinity Testing:
    - a. Perform at a rate of three tests for the first 1,000 square feet and one additional test for each 1,000 square feet thereafter.
    - b. Anhydrous Calcium Chloride Test: ASTM F1869; proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
    - c. Internal Relative Humidity Test: ASTM F2170; proceed with installation only after substrates have a maximum relative humidity level of 75%RH or less.
    - d. Digital Alkalinity-pH Test: ASTM F710; proceed with installation only after substrates have a result of 9.0pH or less.
    - e. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- D. Remove substrate coatings and other substances that are incompatible with floor covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- E. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- F. Move floor coverings and installation materials into spaces where they will be installed at least 72 hours in advance of installation.

1. Do not install floor coverings until they are same temperature as space where they are to be installed.

- G. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 ~~FITNESS FLOORING AND LINOLEUM SHEET FLOORING~~ [ADDENDUM 4]  
INSTALLATION

- A. Unroll sheet floor coverings and allow them to stabilize before cutting and fitting.
- B. Lay out sheet floor coverings as follows:
  1. Maintain uniformity of floor covering direction.
  2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches (152 mm) away from parallel joints in floor covering substrates.
  3. Match edges of floor coverings for color shading at seams.
  4. Avoid cross seams.
  5. Eliminate deformations that result from hanging method used during drying process (stove bar marks).
- C. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.
- D. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.
- E. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on subfloor. Use chalk or other nonpermanent marking device.
- F. Install floor coverings on floor box covers and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of floor coverings installed on covers. Tightly adhere floor covering edges to substrates that abut covers and to cover perimeters.
- G. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- H. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.

3.4 [ADDENDUM 4] LINOLEUM TILE AND LUXURY VINYL TILE INSTALLATION

- A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
  1. Lay tiles square with room axis in pattern indicated.



- B. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
- C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
- D. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, non-staining marking device.
- F. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- G. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- H. Conform to RFC1-TM-6 for joint tightness and for corner intersection unless layout pattern shows random corner intersection. More than 5 percent of the joints not touching or any joint more than 0.0051-inch wide will not be accepted.

### **3.5 WALL BASE INSTALLATION**

- A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- D. Do not stretch wall base during installation.
- E. Fit joints tight and vertical. Maintain minimum measurement of 24-inches between joints.
- F. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends use premolded units.
- G. Install base on solid backing. Bond tight to wall and floor surfaces.
- H. Scribe and fit to door frames and other interruptions.
- I. Premolded Corners: Install premolded corners before installing straight pieces.

- J. Where base wraps around columns, ensure that seams are terminated with a mitered joint at the corners of the column. Offset, asymmetrical seams are not permissible.

### 3.6 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering transitions to adjacent flooring materials.

### 3.7 CLEANING AND PROTECTION

- A. Construction Waste Management: Manage construction waste in accordance with provisions of Section [ADDENDUM 3] 01 35 13.26 Construction Waste Management and Disposal. Submit documentation for Credit MR 2 to satisfy the requirements of that Section.
- B. Perform the following operations immediately after completing resilient wall base installation:
  - 1. Remove visible adhesive and other surface blemishes using cleaner recommended by wall base manufacturers.
  - 2. Sweep and vacuum floor coverings thoroughly.
  - 3. Damp-mop floor coverings to remove marks and soil.
    - a. Do not wash floor coverings until after time period recommended by manufacturer.
- C. Protect resilient flooring and wall base against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended in writing by manufacturer.
  - 1. ~~Apply protective floor polish to surfaces that are free of soil, visible adhesive, and surface blemishes. [Addendum 4]~~
    - a. ~~Seal linoleum as recommended by manufacturer but with not less than two coats of floor polish. [Addendum 4]~~
    - b. ~~Use commercially available product acceptable to manufacturer. [Addendum 4]~~
    - c. ~~Coordinate selection of floor polish with Owner's maintenance service. [Addendum 4]~~
  - 2. Cover linoleum floor coverings with undyed, untreated building paper until inspection for Substantial Completion.
    - a. Allow drying room film (yellow film caused by linseed oil oxidation) to disappear before Substantial Completion.
  - 3. Do not move heavy and sharp objects directly over floor covering surfaces. Place plywood or hardboard panels over floor coverings and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 09 65 00

[ADDENDUM 4] SECTION 099620 - ANTI GRAFFITI COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This section includes surface preparation and field application of anti-graffiti coating systems to items and surfaces scheduled.
- B. Related Sections include the following:
  - 1. Section 033010 "Cast-in-place Concrete" for concrete finishes.

1.3 SUBMITTALS

- A. Product Data: For each coating system indicated. Include block fillers and primers.
  - 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference the specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
  - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each material specified.
- B. Certification by manufacturer that products supplied comply with requirements indicated that limit the VOCs in coating products.
- C. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate.
- D. Qualification Data: For Firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owner, and other information specified.
- E. Warranty (see section 1.9).

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage Manufacturer to provide an American Polymer "Certified" applicator who has completed anti-graffiti coating system applications similar in material and

extent to those indicated for Project, and whose work has a record of successful in-service performance.

- B. Source Limitations: Obtain base coatings, top coatings, and removal agent from the same manufacturer.

## 1.5 PERFORMANCE REQUIREMENTS

- A. Provide anti-graffiti coating system complying with the following:

1. Permanent coating system. Coatings shall not require re application regardless of number of graffiti taggings during the life of the ten-year performance warranty period.
2. Show no signs of deterioration or change of appearance after graffiti removal during the warranty period. No ghosting staining or shadowing.
3. Capability of removing 100 percent of all types of paint and graffiti materials from treated surfaces without damaging the coating or the substrate.
4. Upon graffiti removal, no evidence of graffiti shall remain.
5. Capable of withstanding a minimum of 120 cleaning cycles over the same area without measurable coating deterioration.
6. Shall not increase dirt pick-up of substrate.
7. Meet the following test results for the following chemicals:

a. MEK	No effect after 5 days
b. Carboxylic Acid	No effect after 5 days
c. 75% Phosphoric Acid	No effect after 5 days
d. 37% HCL	3 hours blister
e. 50% Sulfuric Acid	No effect after 5 days
f. 20% NIT	68 hours blister

- B. Time Tested

1. Provide documentation of performance of the anti-graffiti coating system by written report from a nationally recognized and certified Protective Coating Specialist. Such documentation shall include; type of substrate, location, length of service, testing performed and results.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label with the following information:

1. Name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. Handling instructions and precautions.

- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
  - 1. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and applying coatings.

#### 1.7 PROJECT CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 40 and 100 deg F.
- B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
  - 1. Allow wet surfaces to dry thoroughly and attain temperature and conditions specified before proceeding with or continuing coating operation.

#### 1.8 EXTRA MATERIALS

- A. Furnish extra graffiti removal materials in quantities described below. Package coating material in unopened, factory-sealed containers for storage and identify with labels describing contents.
  - 1. Quantity: One full case (12, 16 ounce bottles).

#### 1.9 WARRANTY

- A. System Performance Warranty: Provide written warranty signed by manufacturer that exhibits defects in materials or workmanship. Defects are defined to include failure to withstand complete graffiti removal, ghosting, shadowing, chemical staining, yellowing, and normal environmental effects. Refer to American Polymer Corporation Ten-Year Warranty. To obtain warranty service the purchaser must contact American Polymer in writing.
  - 1. A third party that is authorized by American Polymer must inspect project.
  - 2. Warranty period: 10 years from date of completion.

### PART 2 - PRODUCTS

#### 2.1 ANTI GRAFFITI SYSTEM/MANUFACTURER

- A. For all flat work:
  - 1. VandlGuard, manufactured by Rainguard International (866-989-5159, [www.rainguard.com](http://www.rainguard.com)), and distributed by Parkman Enterprises, P.O. Box 2852, Orange, CA 92859, 714-593-0875

- B. For all vertical surfaces, site furnishings, fencing, and railings:
  - 1. Blok-Guard and Graffiti Control II, manufactured by Prosoco, Inc. and distributed by Parkman Enterprises, 21300 S Milmlington Ave  
Carson, CA, 90810, 714-593-0875

## 2.2 ANTI-GRAFFITI COATING MATERIALS

- A. VOC Classification: Provide materials that comply with the the Air Quality Management District's VOC classification.
- B. Coatings shall meet requirements of the following:
  - 1. ASTM B 117 and ASTM D 714 (salt spray minimum acceptable of 8000 hours.
  - 2. ASTM D 530 (hardness)
  - 3. ASTM D 412 (tensile strength and elongation)
  - 4. ASTM D 522 (pass 3/8-inch mandral)
  - 5. ASTM 968 (abrasion test)
  - 6. ASTM E 96 (vapor transmission)
  - 7. Water clear, non-yellowing, and free of waxes and urethanes.
  - 8. Shall allow moisture vapor transmission.
- C. GSS-10 Undercoating: Clear VU High Solids Base Coating (AP307); a water-based high performance under coating used as sealer, or approved equal
- D. GSS-10 Top coatings: permanent anti-graffiti top coating.
  - 1. Clear Finish: AP100 Clear Matte [Matte is defined as the finish of the top coating reading less than five degrees on a Gardner Gloss Meter], subject to final approval by Owner's Representative based on color sample submittal.
- E. Graffiti Remover: GSS Erasol or approved equal; Non-flammable, biodegradable, with a pH 7 - 8.5 and recyclable, allowing graffiti removal without the use of blasting equipment, hot water, or high-pressure wash equipment.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Prior to bid, with Applicator present, a job "walk through" examining substrates and conditions under which anti-graffiti coatings will be applied for compliance with coating application requirements is essential. Surface / substrates will vary and must be taken into account.
  - 1. Apply coatings only after unsatisfactory conditions have been corrected and surfaces to receive coatings are thoroughly dry.
  - 2. Start of application is construed as Applicator's acceptance of surfaces within that particular area.

- B. Coordination of Work: Review other sections in which primers or other coatings are provided to ensure compatibility of total systems for various substrates. On request, furnish information on characteristics of specified finish materials to ensure compatible primers.
  - 1. If a potential incompatibility of primers applied by others exists, obtain the following from the primer Applicator before proceeding.
    - a. Confirmation of the primer's suitability for expected service conditions.
    - b. Confirmation of primer's ability to be top coated with materials specified.
  - 2. Notify Engineer about anticipated problems before using the coatings specified over substrates primed by others.

### 3.2 PREPARATION

- A. General: Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of the size or weight of item, provide surface-applied protection before surface preparation and coating.
  - 1. After completing coating operation, reinstall items that were removed; use workers skilled in the trades involved.
- B. Cleaning: Before applying coatings, clean substrates of substances that could impair bond of coatings. Remove oil and grease before cleaning.
  - 1. Schedule cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.
- C. Surface preparation: Clean and prepare surfaces to be coated according to manufacturers written instructions for each substrate condition and as specified.
  - 1. Provide barrier coats over incompatible primers or remove primers and reprime substrate.
  - 2. Cementitious Substrates: Prepare concrete, brick, concrete masonry block, and cement plaster surfaces to be coated. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods to prepare surfaces.
    - a. Do not coat surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
  - 3. Metal Substrates: Clean ferrous-metal surfaces that have been shop coated; remove oil, grease, dirt and other foreign substances.
- D. Material Preparation: Carefully mix and prepare coating materials according to the manufacturers written instructions.
  - 1. Maintain containers used in mixing and applying coatings in a clean condition, free of foreign materials and residue.
  - 2. Stir materials before applying to produce a mixture of uniform density. Stir as required during application.

3.3 APPLICATION

- A. General: Apply coatings according to manufacturer's written instructions.
  - 1. Use applicators and techniques best suited for the material being applied.
    - a. Do not apply coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.
    - b. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until coating has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat does not cause undercoat to lift or lose adhesion.
- B. Application Over Cementitious Surfaces:
  - 1. All natural surfaces to include concrete, all masonry units, brick tile and block should be treated with a siloxane penetrating water sealer: Aqua-lock WB Water Repellent by American Polymer is compatible with the Graffiti Solution System.
  - 2. Base: Minimum of 2 coats equaling 3 to 4 mils minimum dry film thickness [or as many as necessary to achieve a pinhole free surface] of GSS Barrier undercoating as specified by manufacturer.
  - 3. Finish: Minimum of 2 coats of top coating; 3 to 4 mils minimum dry film thickness [or as many coats as necessary to satisfy warranty requirements]
  - 4. Surfaces will vary and the objective is to have the coating work on all substrates, the number of coats could vary as well.
- C. Application Over Primed Metal Surfaces:
  - 1. Finish: 2 coats of top coating; 3 to 4 mils minimum dry film thickness.
- D. Completed Work: Match approved Samples for color, texture, and coverage. Remove, refinish, or recoat work that does not comply with specified requirements.

3.4 FIELD QUALITY CONTROL

- A. Engineer reserves the right to invoke the following procedure at any time and as often as Engineer deems necessary during the period when coatings are being applied:
  - 1. Contractor will engage the services of a qualified testing agency to sample coating material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Engineer.
  - 2. Testing agency will perform appropriate tests for the following characteristics as required by Engineer:
    - a. Quantitative materials analysis.
    - b. Absorption
    - c. Accelerated weathering.
    - d. Accelerated yellowness.
    - e. Alkali and mildew resistance.
    - f. Abrasion resistance.
    - g. Washability.



3. Engineer may direct Contractor to stop applying coatings if test results show materials being used do not comply with specified requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. If necessary, Contractor may be required to remove rejected materials from previously coated surfaces if, on recoating with specified materials, the two coatings are not compatible.
4. Demonstration: Apply alkyd-based graffiti to a 2 ft. sq. treated area selected by the Engineer. 5 days minimum after application, demonstrate complete removal of the graffiti in the presence of the Engineer.

### 3.5 CLEANING

- A. Cleanup: At the end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
  1. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

### 3.6 PROTECTION

- A. Protect work of other trades, whether being coated or not, against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Engineer, and leave in an undamaged condition.
  1. Provide "Wet Paint" signs to protect newly coated finishes. After completing coating operations, remove temporary protective wrappings provided by others to protect their work.
  2. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces. Comply with procedures specified in PDCA P1.

END OF SECTION 099620

SECTION 10 11 00 - VISUAL DISPLAY SURFACES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Tackboards.
- B. Marker Boards with backing and trim. [Addendum 4]**

1.3 LEED REQUIREMENTS

- A. Refer to Section 01 81 13 for LEED requirements related to this Section.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type of visual display surface indicated and as follows:
  - 1. Cork Swatches: Manufacturer's full range of cork colors for color selection.
  - 2. Tack Assembly **and Marker Board Surface [Addendum 4]**: Not less than 8-1/2 by 11 inches (215 by 280 mm), mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.
  - 3. Trim: 6-inch- (152-mm-) long sections of each trim profile including corner section.
  - 4. Rail Support System for Marker Boards: 6-inch- (152-mm-) long sections. [Addendum 4]**
- C. LEED Submittals: See Section 01 81 13 for additional requirements; provide the following:
  - 1. Product Data for Credit EQ 4.4: For composite wood products, documentation indicating that the product contains no urea formaldehyde.
  - 2. Product Data for Credit EQ 4.1: For adhesives, including printed statement of VOC content and chemical components.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For visual display surfaces to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of visual display surface through one source from a single manufacturer.

- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of visual display surfaces and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- C. Fire-Test-Response Characteristics: Provide fabrics with the surface-burning characteristics indicated, as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-built visual display boards completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefabricate components at the factory, disassemble for delivery, and make final joints at the site.
- B. Store visual display units vertically with packing materials between each unit.

#### 1.8 WARRANTY [ADDENDUM 4]

- A. **Porcelain Enamel Marker Board Warranty: Furnish the manufacturer's written warranty, agreeing to replace porcelain enamel marker boards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking, provided the manufacturer's instructions with regard to handling, installation, protection, and maintenance have been followed.**
  - 1. **Warranty Period: 25 years.**

### PART 2 - PRODUCTS

#### 2.1 LEED MATERIAL REQUIREMENTS, GENERAL

- A. Composite Wood and Agrifiber: Use only composite wood and agrifiber products free of added urea formaldehyde resin binders.
- B. VOC Content: Adhesives, sealants, paints, welding, and coatings applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 81 13 - Sustainable Design Requirements.
  - 1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

#### 2.2 WALL-MOUNTED BULLETIN BOARDS

- A. Basis-of-Design Product: The design for the tackboards is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
  - 1. Basis-of-Design: Claridge Products & Equipment, Inc., as indicated on Drawings.
  - 2. Best-Rite Manufacturing.
  - 3. Ghent Manufacturing Inc.

4. Accepted equivalent.
- B. Tack Surface: **[Addendum 4]** Linoleum-based surfacing material.
  1. Basis-of-Design Product: ~~Forbo Bulletin Board~~ **As indicated on Drawings.**
  2. Color: As indicated on Drawings.
  3. **Frame: As indicated on Drawings.**
  4. **Size: As indicated on Drawings.**

## 2.3 MARKER BOARDS **[ADDENDUM 4]**

- A. **Porcelain Enamel Marker Boards:** Provide balanced, high pressure laminated, high gloss porcelain enamel Marker Boards of 3 ply construction consisting of face sheet, core material and backing. **[Addendum 4]**
  1. **Color: White.**
- B. **Surface:** Provide face sheet of magnetic, 24 gauge face over backing. Coat the exposed face and exposed edges with a 3 coat process consisting of primer, ground coat, and color cover coat, and the concealed face with a 2 coat process consisting of primer and ground coat. Fuse cover and ground coats to steel at the manufacturer's standard firing temperatures, but not less than 1,200 degrees Fahrenheit.
- C. **Backing:** 1/4-inch thick interior type standard underlayment bearing trademark of APA or high quality hardboard as standard with manufacturer.
  1. **Hardboard: AHA A135.4, tempered.**
- D. **Accessories:**
  1. **Aluminum Frames and Trim:** Fabricated from not less than 0.062-inch- (1.57-mm-) thick, extruded aluminum; of size and shape indicated.
    - a. **Factory-Applied Trim:** Manufacturer's standard.
  2. **Chalktray:** Manufacturer's standard, continuous.
    - a. **Solid Type:** Extruded aluminum with ribbed section and smoothly curved exposed ends.
  3. **Marking Implements:** Provide two new boxes of approved markers and one new eraser for each markerboard.
- E. **Extruded Aluminum:** ASTM B221, Alloy 6063.
- F. **Adhesive:** As recommended by manufacturer.

## 2.4 MATERIALS, GENERAL

- A. **Natural Cork Sheet:** MS MIL-C-15116-C, Type II; seamless, single-layer, compressed fine-grain cork sheet; tackboard quality; face sanded for natural finish.
- B. **Hardboard:** AHA A135.4, tempered.
- C. **Particleboard:** Not permitted.
- D. **Fiberboard:** Not permitted.

- E. Extruded-Aluminum Bars and Shapes: ASTM B221 (ASTM B221M), Alloy 6063.
- F. Aluminum Tubing: ASTM B429, Alloy 6063.
- G. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened, except provide hot-dip galvanized, stainless-steel, or aluminum fasteners for exterior applications. Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view.

## 2.5 FABRICATION

- A. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.
  - 1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.
- B. Fabricate tackboards to requirements indicated for dimensions, design, and thickness and finish of materials.
- C. **Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive. [Addendum 4]**
- D. **Assembly: Provide factory-assembled markerboard units, except where field-assembled units are required. [Addendum 4]**
- E. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to neat, hairline closure.

## 2.6 ALUMINUM FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- E. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance.
- B. Examine walls and partitions for proper backing for visual display surfaces.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Remove dirt, scaling paint, projections, and depressions that will affect smooth, finished surfaces of visual display boards.
- B. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, and substances that will impair bond between visual display boards and surfaces.

#### 3.3 INSTALLATION, GENERAL

- A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
  - 1. Mounting Height: As indicated on Drawings.

#### 3.4 INSTALLATION OF FACTORY-FABRICATED VISUAL DISPLAY UNITS

- A. Tackboards: Attach units to wall surface with concealed wood cleats screwed to wall.
- B. **Marker Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches (400 mm) oc. Secure both top and bottom of boards to walls. [Addendum 4]**
  - 1. **Attach chalktrays to boards with fasteners at not more than 12 inches (300 mm) oc. [Addendum 4]**

#### 3.5 CLEANING AND PROTECTION

- A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 35 13.26 Construction Waste Management. Submit documentation for Credit MR 2 to satisfy the requirements of that Section.
- B. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.
- C. Touch up factory-applied finishes to restore damaged or soiled areas.

- D. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION 10 11 00

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SECTION 10 14 00

IDENTIFICATION DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: Provisions of Code-required signs, exterior and interior building signs, monument signs.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.
- C. Related Sections:
  - 1. Section 08 11 13—Steel Doors and frames: Provision of steel doors.
  - 2. Section 08 14 16—Flush Wood Doors: Provision of wood doors.
  - 3. Section 09 29 00—Gypsum Board: Provision of gypsum board surfaces.
  - 4. **[Addendum 4] Section 03 30 00—Cast-in-Place Concrete walls**

1.2 REFERENCES

- A. ADA: Americans with Disabilities Act
- B. CBC: California Building Code, **[Addendum 4] 2008 2016** Edition
- C. T24: Title 24.

1.3 SYSTEM DESCRIPTION

- A. Design Requirements: Design all signs as indicated and to meet ADA and CBC Title 24 requirements. In the event a conflict is encountered between the contract documents and either of these codes, submit a proposed solution to the Architect for approval prior to fabricating signs.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements
  - 1. Comply with ADA and CBC Braille signage requirements.
  - 2. Provide signs at public toilet rooms with the following text: WOMEN, MEN.

1.5 SUBMITTALS

- A. Presubmittal Conference: Coordinate with the Architect prior to preparation of submittals to confirm submittal requirements and schedule.
- B. Product Data: If requested by Architect, submit manufacturers' catalog sheets, brochures, diagrams, schedules, charts, illustrations, test results and/or other standard descriptive data.



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1. Mark up each copy to identify pertinent materials, products or models.
  2. Show dimensions and clearances required, performance characteristics and capabilities, and wiring diagrams and/or controls as apply.
- C. Shop Drawings:
1. All shop drawings shall be neat, well organized and clearly legible. Elevations and plan views from the Construction Drawings may be reproduced for the sake of expedience where appropriate.
  2. All shop drawings shall be drawn to scale and not subsequently reduced to fit a drawing format.
  3. Submit elevations and plan views for all sign types, including graphic layouts, complete dimensions, materials, locations of all exposed fasteners, colors and finishes. Determine the total quantity for each sign type and not it in the shop drawings.
  4. Submit comprehensive section drawings for sign types where applicable, including sections of all typical members. Show fabrication and installation details, including details for securing members to one another, to building structures, and/or to site work. Show interior construction, reinforcements, anchorages, components and finishes. Reproduction of section drawings shown in Construction Drawings shall not be acceptable.
  5. Site Condition Verification: Where required by the Architect for specific items, Contractor shall inspect site to confirm installation conditions, then submit shop drawings and/or written documentation for approval indicating proposed mounting devices.
  6. Exact replications of Bid documents will be rejected.
- D. Samples:
1. Color and Finish: Submit 3 each, 6 inch by 6 inch samples of all paint colors, screen colors, vinyl colors and material finishes. All paint and screen colors are to be applied to the appropriate substrate.
    - a. Contractor to submit verification of paint manufacturer used for submittal.
    - b. Prior to submittal, Contractor shall verify that all colors submitted as samples match accurately the samples or specifications provided by Architect.
  2. Typeface(s): Submit complete typeface font(s), including upper and lower case letters, numbers and punctuation, for all typeface(s) specified. Also submit samples of letter and word spacing for each cap height specified. Architect to provide all necessary fonts and electronic vector (Adobe Illustrator EPS) artwork where necessary.
- E. Prototypes: Submit one full-size complete prototype each for the following Sign Types:
1. 1 acrylic letter
  2. 1 fabricated stainless-steel letter
  3. 1 wayfinding directional sign
  4. 1 room ID sign
  5. Acrylic samples
  6. 1 ADA/T24 acrylic photopolymer sign
  7. Vinyl samples
- F. Patterns: Submit one full size pattern for each sign type. All patterns shall be printed on a single carrier sheet and shall include the perimeter of the sign panel.

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G. Quality Control:

1. Samples and prototypes may be permanently installed if approved, unless otherwise noted by the Architect.
2. If requested by Architect, submit manufacturer's installation instructions for each type of specialty sign. Include only pages which are pertinent, or manufacturer's standard drawings modified to delete non-applicable data.

1.6 QUALITY ASSURANCE

- A. Do not scale drawings for dimensions. Use only the written dimension indicated on the Drawings, unless such be found in error. Contractor shall verify and be responsible for all dimension and conditions shown by the Drawings, and shall visit the site to inspect and verify field conditions prior to fabrication and installation. The Architect shall be notified, in writing, of all discrepancies on the Drawings, in field dimensions or conditions, and of changes required in construction details.
- B. Provide each type of sign as a complete unit produced by a single manufacturer, including all required mounting accessories, fittings and fastenings.
- C. All details shown in the Drawings shall be followed for exterior appearance. Minor changes in interior construction will be accepted in order to conform to Contractor's shop practices or engineering requirements when, in the Architect's sole judgement, such changes do not detract materially from design concept or intent. Contractor shall circle all such changes on the shop drawings.
- D. Completed work shall be structurally sound, and free from scratches, distortions, chips, breaks, blisters, holes, splits or other disfigurements considered as imperfections for the specific material.

PART 2 - PRODUCTS

2.1 ACCEPTABLE SIGN FABRICATORS

- A. VKK Signs  
812 Sweeney Avenue, Redwood City CA 94063  
650-368-3688  
Dan Kitzmiller
- B. Lahue & Associates  
2280 Palou Avenue, San Francisco CA 94124  
415-206-9136  
John Gallagher
- C. Martinelli Environmental Graphics  
1829 Egbert Avenue, San Francisco, CA 94124  
415-468-4000  
Kris Harms

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- D. The proposed substitution of other sign fabricators for those listed above may be considered by the Architect if said sign fabricator(s):
1. Demonstrates that his/her applicable product(s) are equal in salient characteristics such as construction, quality, durability, appearance and warranty to those of the acceptable sign fabricators listed.
  2. Supplies three positive references for comparable work.

## 2.2 MATERIALS

- A. Aluminum
1. Flat Sheet or Barstock for all work as required, brushed finish fine #6.
- B. Cast Acrylic Sheet:
1. Provide cast (not extruded or continuous cast) methyl plastic sheet, in sizes, thickness and finishes indicated, with an minimal flexural strength of 16,000 pounds per square inch when tested in accordance with ASTM D790, and a maximum allowable continuous service temperature of 176 degrees Fahrenheit.
  2. Cast acrylic sheet shall have a flame resistance such that application of a lighted match shall not produce melting, flashing, flaring or distortion. This material shall not ignite at a temperature less than 800 degrees Fahrenheit.
  3. Carefully follow manufacturer's recommended fabrication procedures regarding expansions/contractions, fastening and restraining of acrylic plastic.
- C. Braille:
1. Contractor shall be responsible for the accurate translation of all applicable tactile copy to Contracted Grade 2 Braille upper and lower case. All Braille shall be produced in accordance with California Title 24 requirements: Dots shall be 1/10 inch (2.54 mm) on centers in each cell with 2/10 inch (5.08 mm) space between cells. Dots shall be raised on a minimum of 1/40 inch (0.635 mm) above the background.
- D. Applied Tactile Copy:
1. Provide 1/32" Rowmark ADA Alternative Applique in color called out in the construction drawings. No substitutions on this item, which is available through:  
  
Laminated Fabricators  
1145 San Mateo Avenue, San Bruno, CA 94066  
(800) 526-3225
- E. Fasteners, Hardware and Devices: Stock proprietary fastening devices approved standard manufacture such as cadmium plated screws, bolts and washers, and stainless steel hinges. Use SST fasteners where specified.
1. Conceal all fasteners expect where noted or shown otherwise.
  2. Finish on all exposed devices to match overall sign finish, unless otherwise noted.
  3. Provide vandal-resistant fasteners at all exposed locations unless otherwise noted.
  4. Use fasteners fabricated from metals that are noncorrosive to either the sign material(s) or mounting surface.
- F. Very High Bond Tape: Provide #4905/.020"/clear and/or #4950/.045"/white closed cell acrylic foam carrier with VHB adhesive, very high solvent resistance and very high shear and peel adhesion, as manufactured by 3M Scotch or approved equal.

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## G. Acrylic Polyurethane Paint:

1. Provide acrylic polyurethane with ultraviolet inhibitors and lightfast, weather, abrasion and graffiti resistant additives as manufacturer's Matthews Paint Company, (800) 323-6593. Prime and finish coats shall be mixed and applied in accordance with manufacturer's specifications. Paint finish shall be smooth, free of scratched, gouges, drops, bubbles, thickness variations, foreign matter or other imperfections.
  - a. Provide as CCR Title 24-compliant nonglare finish for all interior applications.
  - b. Provide semigloss finish for all exterior applications.
2. Colored Coatings for Cast Acrylic Sheet: Use paints for background color which are recommended by acrylic manufacturer for optimum adherence to acrylic surfaces and are non-fading for application intended.
3. Contractor shall provide verification of paint manufacturer used for all paint work.

## H. Screen Media

1. Screened graphics shall be produced with screening ink or paint compatible with substrate, using mesh of 390 or finer to produce clean, sharp edges. Media are to be opaque, with full even coverage, and free from hickeys, dust, bubbles and/or other blemishes or foreign matter.

## I. Vinyl Film: Provide opaque reflective or non-reflective vinyl film as indicated, 0.0355 minimum thickness, with pressure sensitive permanent adhesive backing; 3M Scotchcal or approved equal. All colors shall be integral and not surface applied except where custom color(s) are specified in the Drawings. All custom colors shall be flood coated on white vinyl.

## J. [Addendum 4] Graphic Concrete:

1. **Cast-in-place concrete tilt-up wall with graphics applied to surface using Graphic Concrete process. Process involves electronic photographic and/or vector art converted to membrane, and applied with chemical reaction to surface of wet concrete with pigmentation as needed.**
2. **MWD and Architect to provide photograph via Client.**
3. **No substitutions on this process without authorization from Architect and Matthew Williams Design.**
4. **Contact: Lena Weckström, Consulting Architect,  
Business Development Manager  
Mobile + 358 40 8697 805  
[lena.weckstrom@graphicconcrete.com](mailto:lena.weckstrom@graphicconcrete.com)  
<http://www.graphicconcrete.com>**

## 2.3 FABRICATION

- A. Intent of Specifications: All finished work shall be of the highest quality in order to pass eye-level examination and scrutiny by Architect.
1. All Work shall be free from burrs, dents, raw edges and sharp corners.
  2. Finish all welds on exposed surfaces as required so they are not visible in the finished Work.
  3. Finish all surfaces smooth unless otherwise indications or specified.

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4. Surface which are intended to be flat shall be free from bulges, oilcanning, gaps or other physical deformities. Such surfaces shall be fabricated to remain flat under installed conditions.
  5. Surfaces which are intended to be curved shall be smoothly free-flowing to the required shape(s).
  6. Fabricate all cabinets, panels and components with smooth, mechanically finished edges. All edges shall be true, and all corners shall be square. Where edges are specified to be painted, fill and sand smooth as required prior to painting.
  7. Cut routed letterforms and/or graphics clean and true to match adjacent surface-applied letterforms and/or graphics.
  8. Exercise care to protect all polished and/or plated surfaces so that they remain unblemished in the finished Work.
  9. Isolate dissimilar materials. Exercise particular care to isolate nonferrous metals from ferrous metals as required to prevent corrosion.
  10. All surfaces shall be flat to a tolerance of plus or minus 1/16' when measured at any point with a ten foot straight edge.
  11. All visible sign surfaces of the same type shall have the same finish. Color and/or finish shall be consistent across the entire surface of a sign.
  12. All reveals shall be uniform width; all butt joints shall be tight and closed along the entire length; all access panels shall have a nominal, uniform gap all around.
  13. All expansion joints, when required, shall be positioned so as not to interfere with the look or finish of any sign message or the overall appearance of the sign face.
  14. All gaps between milled components, when assembled, shall not exceed a tolerance of .005."
- B. Provide colors and/or finish textures as specified or indicated in the Drawings or, where not specified or indicated, as selected by Architect.
1. Interior Colors/Finishes: Colors of sign graphics (text, arrows and/or symbols) shall have a minimum of 70% contrast with sign background behind graphics. Finish shall be nonglare on all sign backgrounds behind graphics on identifications and directional signs.
- C. Graphics: All text, arrows and symbols shall be provided in the sizes, colors, typefaces and spacing specified in the Drawings. All text shall be a true, clean digitally or photomechanically accurate reproduction of the typeface(s) specified, with letterspacing and directional arrows as shown in the Drawings.
1. Lettering: Custom Typography: Use Macintosh OSX fonts and digital files provided by Architect.
  2. Arrows and Symbols: Use digital files provided by Architect in Adobe Illustrator CS5 for Macintosh.
  3. Custom shapes and graphics: Use digital files provided by Architect in Adobe Illustrator CS5 for Macintosh.
- D. Sign Schedule: Copy shown in Drawings is for layout purposes only; all final copy, quantities and references for all signs are shown in the Sign Schedule unless otherwise noted. The Contractor shall clarify any perceived irregularities in the Sign Schedule with the Architect prior to fabrication.
- E. Digital Artwork: All digital artwork files prepared by the Architect for the Contractor's use shall be in a single layer. Any and all manipulations of the files requires for subsequent use

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by the Contractor, such as spreads and traps for silkscreen negatives, or conversion to outline or EPS, shall be the responsibility of the same unless explicitly agreed otherwise by the Architect.

## PART 3 - EXECUTION

## 3.1 INSPECTION

- A. Architect reserves the right to inspect the Work in the Contractor's shop before it is shipped to the job site for installation.
- B. Contractor shall inspect all installation locations for conditions which will adversely affect the execution, performance and/or quality of the Work, and notify Architect in writing of any and all unsatisfactory conditions. Contractor shall not proceed with installation until said unsatisfactory conditions have been corrected. Commencement of the installation indicated acceptance of the site conditions and guarantees delivery of an acceptable product.

## 3.2 INSTALLATION

- A. Pre-installation Walkthrough/Field-Staking: Attend a pre-installation walkthrough at the job site to confirm all typical installation conditions and determine installation locations for nontypical conditions. The exact locations of all exterior signs will be determined and field-staked at this time. Do not begin excavation for the footing for any exterior sign until the field-staked locations has been approved by the Architect and/or Owner's representative.
- B. Provided reinforced concrete footings where required, with plan dimensions as shown and depth as specified by Engineer. Use sonotube type formwork for post and panel signs at all landscape locations; core drill and set post(s) in epoxy grout at all hardscape locations.
- C. Where a concrete footing is level with finished grade to serve as a mow strip, slope the top of the footing away from the sign cabinet or post(s) minimally as required for drainage and to prevent puddling.
- D. Securely attach all signs to footings or site work in accordance with Engineer's specifications.

## 3.3 SIGN LOCATIONS

- A. All signs identifying permanent rooms and spaces shall be located in compliance with CBC 1117B.5.9: Center of sign to be 5'0" above finish floor. Sign to be located at latch side of door, or, if there is insufficient wall space, on the nearest wall, preferably to the right.
- B. Symbol signs on restroom doors shall be located in compliance with CBC 1115B.5: Center of sign to be 5'0" above finish floor. Sign to be centered left to right on door.

## 3.4 SITE CLEANUP

- A. Final cleanup:
  - 1. Clean and /or repair all evidence of installation work or damage to site work or other adjacent surfaces prior to completion of work.

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2. Clean up work area after all installation have been completed. Restore all disturbed ground cover.
3. Remove all protective materials and dispose of properly off site.

**3.5 CLEANING AND PROTECTION**

- A. At completion of installation, clean all sign surfaces in accordance with manufacturer's instructions.
- B. Protect all signs from damage until acceptance by Architect ; repair or replace damaged units as required.
- C. Clean and/or repair all evidence of installation work or damage to adjacent surfaces prior to completion of work.
- D. Remove all protective materials and dispose of properly off site.

**3.6 CONTRACT CLOSE-OUT ITEMS**

- A. Provide Owner with one quart paint for each paint color specified.
- B. Provide Owner with written instructions for proper cleaning of the signs.
- C. Note any solvents that should not be used.

**END OF SECTION**

SECTION 10 22 26 - OPERABLE PARTITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Operable Partitions: Electrically operated, center stacking, top supported operable wall with panels hinged in groups of two.
- B. Pass through door, hardware and identification devices.

1.3 RELATED SECTIONS

- A. Section 05 12 00 – Structural Steel Framing: Steel carrier beams for operable partition top track.
- B. Section 08 71 00 – Door Hardware: Swing door lock cylinder.

1.4 LEED REQUIREMENTS

- A. Refer to Section 01 35 13.20 for LEED requirements related to this Section.

1.5 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Operable panel partitions shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
  - 1. The term "withstand" means "the panels will remain in place without separation of any parts from the system when subjected to the seismic forces specified."
- B. Acoustical Performance: Provide operable panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
  - 1. Sound-Transmission Requirements: Operable panel partition assembly tested for laboratory sound-transmission loss performance according to ASTM E90, determined by ASTM E413, and rated for not less than the STC indicated.
  - 2. Noise-Reduction Requirements: Operable panel partition assembly, identical to partition tested for STC, tested for sound-absorption performance according to ASTM C423, and rated for not less than the NRC indicated.
  - 3. Noise Isolation Class: Not less than 42.



1.6 SUBMITTALS

- A. Product Data: Material descriptions, construction details, finishes, installation details, and operating instructions for each type of operable panel partition, component, and accessory specified. Included data on acoustical performance, surface-burning characteristics, and durability.
- B. Shop Drawings: Show location and extent of operable panel partitions. Include plans, elevations, sections, details, attachments to other construction and accessories. Indicate dimensions; weights; conditions at openings and for storage; and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, and direction of travel. Show blocking to be provided by others. Include the following:
  - 1. Calculations: Calculate requirements for supporting operable panel partitions and verify capacity of carriers and track components to support loads; indicate deflection limits for partition and adjacent construction.
  - 2. Include diagrams for power, signal, and control wiring.
- C. Delegated-Design Submittal: For operable panel partitions.
  - 1. Include design calculations for seismic restraints.
- D. Setting Drawings: For embedded items and cutouts required in other work, including support beam-punching template.
- E. Samples for Verification: For each type of exposed material, finish, covering, or facing indicated, prepared on Samples of size indicated below:
  - 1. Textile: Full width by not less than 36-inch- (914-mm-) long section of fabric from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat.
  - 2. Panel Edge Material: Not less than 3 inches (75 mm) long.
- F. LEED Submittals: See Section 01 35 13.20 for additional requirements; provide the following:
  - 1. Certificates for Credit MR7: Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
    - a. Include statement indicating costs for each certified wood product.
  - 2. Product Data for Credit IEQ 4.1: For installation adhesives, including printed statement of VOC content and chemical composition of each product used.
  - 3. Product Data for Credit IEQ 4.4:
    - a. For each composite-wood product used, documentation indicating that the bonding agent contains no urea formaldehyde.
    - b. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.
- G. Submit acoustical test reports showing product conformance with ASTM E90 and ASTM C423.

- H. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
  - 1. Suspended ceiling components.
  - 2. Structural members to which suspension systems 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. HVAC ductwork, outlets, and inlets.
    - c. Speakers.
    - d. Sprinklers.
    - e. Smoke detectors.
    - f. Access panels.
- I. Seismic Qualification Certificates: For operable panel partitions, 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.
- J. Product Certificates: Submit letter signed by manufacturer certifying that operable walls to be furnished on this project comply with the requirements of the specification.
- K. Product Test Reports: From an independent testing agency indicating that each operable panel partition complies with requirements. Submit the following:
  - 1. Report for STC.
  - 2. Proof load testing of track/trolley/bracket/hanger rod assembly.
  - 3. Other proof load tests as may be identified in the "PART 2" of this specification.
- L. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
  - 1. The Owner reserves the right to field sound test the operable wall within 60 days of the date of substantial completion. Cost for field sound testing shall be the responsibility of the Owner.
- M. Operation and Maintenance Data: For operable panel partitions to include in maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:
  - 1. Panel finish facings and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
  - 2. Seals, hardware, track, carriers, and other operating components.
- N. Warranty: Sample of special warranty.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified in writing by the operable wall manufacturer as qualified to install the manufacturer's partition system for work similar in material, design, and extent to that indicated for this project.
- B. Testing Agency Qualifications: An independent NVLAP-accredited testing laboratory with experience and capability to conduct the testing indicated, as documented according to ASTM E548. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.
- C. Fire-Test-Response Characteristics: Provide panels with finishes meeting one of the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
  - 1. Surface-Burning Characteristics: As determined by testing per ASTM E84.
    - a. Flame-Spread Index: 25 or less.
    - b. Smoke-Developed Index: 450 or less.
  - 2. Fire Growth Contribution: Textile wall coverings comply with the acceptance criteria of NFPA 265.
- D. Forest Certification: Provide components made with cores not less than 50 percent of wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.
- B. Deliver materials in order as required by schedule for installation.
- C. Handle materials in accordance with manufacturer's instructions.

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of operable panel partition openings by field measurements before fabrication.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of operable panel partitions that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Faulty operation of operable panel partitions.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal wear.
  - 2. Warranty Period: Two years from date of Substantial Completion.

1.11 EXTRA MATERIALS

- A. Furnish extra materials from the same production run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Panel Finish-Facing Material: Furnish full width in quantity to cover both sides of two panels when installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.2 LEED MATERIAL REQUIREMENTS, GENERAL

- A. Certified Wood: Use wood based products made from wood obtained from forests certified by an FSC accredited certification body to comply with the Forest Stewardship Councils "Principles and Criteria."
- B. VOC Content: Adhesives, paints, welding, and coatings applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 35 13.10 - Sustainable Project Requirements.
  - 1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Composite Wood and Agrifiber: Use only composite wood and agrifiber products free of added urea formaldehyde resin binders.

2.3 MANUFACTURERS

- A. Basis-of-Design Product: The design for the operable partition system is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
  - 1. Basis-of-Design: Modernfold, Inc.; a DORMA Group Company, Acousti-Seal Encore.
  - 2. Advanced Equipment Corporation.
  - 3. Hufcor.
  - 4. Accepted equivalent.

2.4 PANEL CONSTRUCTION

- A. Operable Acoustical Panels: Operable acoustical panel partition system, including panels, seals, finish facing, suspension system, operators, and accessories.
  - 1. Panel Operation: Electrically operated, paired.
  - 2. STC: Not less than 52.
- B. Dimensions: Fabricate operable acoustical panel partitions to form an assembled system of dimensions indicated and verified by field measurements.
  - 1. Panel Width: As indicated.

- C. Finish: As selected from manufacturer's full range of finishes including premium options.
- D. Panel Construction: Provide top reinforcement as required to support panel from suspension components and provide reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.
- E. Panel Closure: Manufacturer's standard.
- F. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories; with decorative, protective finish.
  - 1. Hinges: Manufacturer's standard.
  - 2. Exit Device: Manufacturer's standard.
- G. Panel Edge Trim: Furnish with protective vertical edge trim that overlaps the panel face and secures finish at the vertical edge.
- H. Panel Trim Finish: Clear satin anodized panel trim.
- I. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories; with decorative, protective finish to match panel trim finish.

## 2.5 SEALS

- A. General: Provide types of seals indicated that produce operable panel partitions complying with acoustical performance requirements and the following:
  - 1. Manufacturer's standard seals.
  - 2. Seals made from materials and in profiles that minimize sound leakage.
  - 3. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable panel partition perimeter and adjacent surfaces, when operable panel partition is extended and closed.
- B. Horizontal Top Seals:
  - 1. Continuous-contact, extruded-PVC seal exerting uniform constant pressure on track.
- C. Vertical Seals: Deep-nesting, interlocking astragals mounted on each edge of panel, with continuous PVC acoustical seals.
- D. Top Seals: Panel top seals shall be fixed, flexible multi-fin.
- E. Horizontal Bottom Seals: PVC-faced, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on floor when extended, ensuring horizontal and vertical sealing and resisting panel movement.
  - 1. Automatically Operated for Acoustical Panels: Extension and retraction of bottom seal automatically operated by movement of partition, with operating range not less than 2 inches (50 mm) between retracted seal and floor finish.

## 2.6 SUSPENSION SYSTEM

- A. Suspension Tracks: Steel or aluminum as noted below with adjustable steel hanger rods for overhead support, designed for type of operation, size and weight of operable panel partitions as indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.
- B. Carriers: Trolley system as required for configuration type, size, and weight of partition and for easy operation; with ball-bearing wheels.
- C. Steel Finish: Manufacturer's standard, factory-applied, corrosion-resistant, protective coating unless otherwise indicated.
- D. Proof Load Testing: Submit test report from nationally recognized independent laboratory showing that assembly of track/trolley/bracket/hanger rod sustains a load of 8,000 pounds at mid-point of 48-inch simple span. Load applied to trolley via pendant bolt.

## 2.7 ACCESSORIES

- A. Pass Doors: Fabricated to comply with ADA requirements. Swinging door built into and matching panel finish and thickness; complete with frames and operating hardware. Hinges finished to match other hardware.
  - 1. Swinging Door: Built into and matching panel materials, construction, acoustical qualities, finish, and thickness, complete with frames and operating hardware. Hinges finished to match other exposed hardware.
  - 2. Single Pass Door/s: Full height of operable partition system; provide with concealed door closer equipped with hold open device.
  - 3. Panic Devices: Flush-set.
  - 4. Exit Sign: Provide above pass doors, flush mounted, self-illuminated.
- B. Storage Pocket Door: Full height at end of partition runs to conceal stacked partition of same basic design, materials, thickness, and acoustical qualities as panels. Hinges in finish to match other exposed hardware, with acoustical seals at soffit, floor, and jambs.
- C. Final Closure: Hinged closure panel.

## 2.8 FINISH FACING

- A. General: Provide finish facings that comply with indicated fire-test-response characteristics and that are factory applied to operable partitions with appropriate backing, using mildew-resistant non-staining adhesive.
  - 1. Apply one-piece facings free from air bubbles, wrinkles, blisters, and other defects, with no gaps or overlaps. Tightly secure and conceal raw and selvage edges of facing for finished appearance.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine flooring, structural support, and opening, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable panel partitions.
- B. Confirm electrical points of connection have been installed and are ready to receive the Work of this Section.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. General: Comply with ASTM E557 except as otherwise required by operable panel partition manufacturer's written installation instructions.
- B. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed.
- C. Install panels from marked packages in numbered sequence indicated on Shop Drawings.
- D. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.
- E. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.

#### 3.3 FIELD QUALITY CONTROL

- A. Optional Testing: Owner reserves the right to field sound test partition installation within 60 days of installation. Owner shall engage a qualified, professional, acoustical engineer to perform field tests and to prepare test reports. Cost of the field sound tests shall be responsibility of the Owner.
- B. Testing Methodology: Perform testing of installed operable panel partition for noise isolation according to ASTM E336, determined by ASTM E413, and rated for not less than NIC indicated. Adjust and fit partitions to comply with NIC test method requirements.
- C. Repair or replace operable panel partitions that do not comply with requirements.
  - 1. Should operable panel partitions fail to achieve the specified NIC, partition supplier shall make corrections/adjustments and pay for the cost of retesting.
  - 2. In the event that the specified NIC is not achieved after corrections/adjustments and retesting and the partition supplier has not been able to demonstrate that flanking sound through the surrounding building construction is the cause for failure then the partition supplier, at its own cost, shall replace the operable partition with a new partition that is capable of achieving the specified NIC and pay for the cost of field sound testing this partition installation.
- D. Prepare written test and inspection reports and submit to the Owner.

3.4 ADJUSTING

- A. Adjust operable panel partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunctioning, throughout entire operational range. Lubricate hardware and other moving parts as indicated by wall manufacturer.
- B. Adjust storage pocket doors to operate smoothly and easily, without binding or warping. Check and readjust operating hardware. Confirm that latches and locks engage accurately and securely without forcing or binding.

3.5 CLEANING

- A. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 35 13.26 Construction Waste Management. Submit documentation for Credit MR 2 to satisfy the requirements of that Section.
- B. Clean soiled surfaces on completing installation of operable panel partitions, to remove dust, adhesives, and other foreign materials according to manufacturer's written instructions.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure operable panel partitions are without damage or deterioration at time of Substantial Completion.
- D. Replace panels that cannot be cleaned and/or repaired, in a manner approved by Architect, before time of Substantial Completion.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable panel partitions.
  - 1. Test and adjust seals, hardware, carriers, tracks, pass doors, pocket doors, controls, safety devices and other operable wall components. Replace damaged or malfunctioning operable components.
- B. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
- C. Review data in maintenance manuals.

END OF SECTION 10 22 26



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**SECTION 11 51 16 – BOOK DEPOSITORIES [Addendum 4]**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**1.2 SECTION INCLUDES**

- A. Library book depositories.

**1.3 RELATED SECTIONS**

- A. Section 11 51 23 – Library Stack System.

**1.4 LEED REQUIREMENTS**

- A. Refer to Section 01 35 13.20 for LEED requirements related to this Section.

**1.5 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Detail depository assemblies and indicate installation details, dimensions, and required clearances, method of field assembly, components, and location and size of each field connection.

**1.6 INFORMATIONAL SUBMITTALS**

- A. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

**1.7 QUALITY ASSURANCE**

- A. NFPA Compliance: Provide depositories complying with NFPA 82.

**PART 2 - PRODUCTS**

**2.1 LEED MATERIAL REQUIREMENTS, GENERAL**

- A. VOC Content: Adhesives and sealants applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 35 13.20 - Sustainable Design Requirements.
  - 1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## 2.2 MANUFACTURERS

- A. Basis-of-Design Product: The design for the book depository is based on the manufacturer identified below. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. Basis-of-Design: Kingsley Companies; "ease slimLine thruWall" interior book return.
  2. American Book Returns.

## 2.3 THRU-WALL BOOK DEPOSITORIES

- A. Construction Materials:
1. Chute: .040 inch Aluminum
  2. Faceplate: 18 gauge Stainless Steel
  3. Slide: .040 inch Aluminum
- B. Overall Dimensions: 22-7/8"w x 11"h x 8-13/16"d
- C. Depository Opening: 19-5/8" x 3 .5"
- D. Construction Methods:
1. Chute: The chute housing has four sides with integrated side, extends 8 inches from the faceplate and will cover the wall rough cuts when installed.
  2. Faceplate: Flat profile with the depository door is built into chute and opens upward; gravity and weight balanced allowing it to automatically close after materials have passed through. All edges are honed smooth.
  3. Theft Deterrence: The angle of the bottom of chute and length of the internal chute help to prevent reaching inside through the depository door.
  4. ADA compliant.
- E. Wording on Door: To be selected by Architect.
- F. Locking Method: Depository door locks from inside with dual spring loaded thumbscrews
- G. Book Truck: Heavy gauge galvanized steel, reinforced at each corner, edge and base.
1. Size: 20" x 30" x 32-inches high.
  2. Floor: "No-tip" depressible floor covered by durable liner and a one inch pad.
  3. Handle: Hoop-shaped handle.
  4. Casters: Four 3-inch diameter hard rubber, non-marring casters, with front two swivel-type.
- H. Provide support units, expansion joint materials, counterflashing and retainer band, special intake depository throat sections to accommodate intake door units, discharge door units.

2.4 FABRICATION

- A. General: Factory-assemble depositories to greatest extent practical with continuously welded or lock-seamed joints without bolts, rivets, or clips projecting on depository interior. Include intake-door assemblies and depository-support frames at each floor, and depository expansion joints between each support point.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install depositories, plumb, without offsets or obstructions that might prevent materials from free falling within depositories.
- B. Intake and Discharge Doors: Interface door units with throat sections of depositories for safe, snag-resistant, sanitary depositing of materials in depositories by users.

3.2 TESTING

- A. Test depository components after installation. Operate doors, locks, and interlock systems to demonstrate that hardware is adjusted and electrical wiring is connected correctly. Complete test operations before installing chase enclosures.

3.3 CLEANING

- A. After completing chase enclosure, clean exposed surfaces of depository system's components. Do not remove labels of independent testing and inspecting agencies.
- B. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 35 13.26 Construction Waste Management. Submit documentation for Credit MR 2 to satisfy the requirements of that Section.

3.4 DEMONSTRATION

- A. Demonstrate use of depository and equipment to Owner's personnel.

END OF SECTION 11 51 16

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SECTION 11 51 23 - LIBRARY STACK SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Library stack systems, including the following, as required for complete installation and as indicated:
  - 1. Single and double loaded stack type shelving systems.
  - 2. Cantilever type stacks.
  - 3. Custom stacks.
  - 4. Accessories.
  - 5. **Mobile shelving on concealed casters. [Addendum 4]**

1.3 RELATED REQUIREMENTS [ADDENDUM 4]

- A. **Section 06 41 00 – Architectural Woodwork: For end panels and canopy tops for library stacks. [Addendum 4]**
- B. **Section 11 51 16 – Book Depositories.**

1.4 LEED REQUIREMENTS

- A. Refer to Section 01 35 13.20 for LEED requirements related to this Section.

1.5 DESIGN REQUIREMENTS

- A. Design stacks as indicated on Drawings, cantilever type, unit construction, designed with individual frame assemblies.
  - 1. Welded frame every other unit and starter and adder combinations are not acceptable.
  - 2. Commercial and case type shelving shall not be considered.
  - 3. Modular Construction: Components of stack system may be divided for rearrangement without procuring additional components.
  - 4. Bracing that prevents insertion of oversize material (past center line) on any base or adjustable shelf is not acceptable.
  - 5. Completed Installation: Neat and finished appearances, free of exposed sharp edges and projections.

1.6 PERFORMANCE REQUIREMENTS

- A. Design and anchor shelving for forces equivalent to requirements of CBC for Seismic Category D and I-1.0.
- B. Design system, including columns, bases, connections, and anchorages, capable of resisting lateral seismic force of  $FR+0.30 W_p$  in any direction, acting simultaneously with vertical seismic force equal to one third of horizontal force  $F_p$ .
  - 1. Allowable stresses and other design criteria shall be as permitted by referenced code.
  - 2.  $W_p$  is defined as the total weight of the shelving system plus 50 psf of shelving to account for book storage.
  - 3. Investigate stresses and deflections for shelves fully loaded in combination with seismic forces, and loaded one side in combination with seismic forces.
  - 4. Anchor shelving to structure, regardless of height.
- C. Use anchorages with specified drilled-in anchors at ICC-ES approved allowable capacities without the one third increase in allowable stress permitted in CBC.
- D. Manufacturer shall be prepared, upon request, to submit calculations for design and anchorage of stacks, prepared by a structural engineer licensed in the State of California.
- E. Overhead bracing and bracing between stacks shall not be permitted.

1.7 ACTION SUBMITTALS

- A. Product Data: Furnish manufacturer's literature including information regarding each type of library bookstack equipment.
- B. Shop Drawings: Submit shop drawings for each type of library bookstack range equipment, showing details, dimensions, layout of installation, and methods of anchorage to structure.
  - 1. Include 8-1/2" by 11" elevations of shelving types indicated on shelving schedule.
- C. Samples: Submit samples of each exposed finish required.
  - 1. ~~Submit sample of end panel with custom wood sign holder.~~ [Addendum 4]

1.8 INFORMATIONAL SUBMITTALS

- A. Product Certification: Submit manufacturer's certification that products comply with requirements of the specifications. A list of deviations must be provided for all items not meeting the specifications. The document must include appropriate justification of the alternate proposed design.
- B. Seismic Certificate: Submit detailed certification by structural engineer licensed in California indicating system complies with applicable codes and Contract Documents for seismic design.
  - 1. Upon request of authorities, submit calculations of seismic forces for fully loaded bookstacks, clearly indicating compliance with seismic design requirements.

1.9 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide library shelving by one manufacturer for entire Project with minimum five years successful experience in manufacture of shelving comparable to those required.
- B. Installer Qualifications: Firm acceptable to manufacturer and with minimum five years successful experience in installation of shelving systems comparable to those required.
  - 1. Installer shall have Class C-61 Limited Specialty Contractor license.
- C. Source Limitations: Obtain library stack system through one source from a single manufacturer.
- D. Preinstallation Conference: Conduct conference at project site. Review methods and procedures related to installation of library stack system including, but not limited to, the following :
  - 1. Meet with Architect, Owner, Owner's insurer if applicable, shelving Installer, access flooring Installer, and installers whose work interfaces with or affects stack system.
  - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 3. Review methods and procedures related to shelving installation, including manufacturer's written instructions.
  - 4. Examine raised flooring conditions and finishes for compliance with requirements, including flatness and fastening.
  - 5. Review structural loading limitations of raised flooring during and after shelving installation.
  - 6. Review temporary protection requirements for shelving system during and after installation.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver library stack system and equipment to Project site when spaces to receive them have been completed, including finish flooring installation.
- B. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.
- C. Label factory packages to indicate contents.
- D. Unload materials carefully and store on clean, dry surface or raised platform in safe area protected from weather.

1.11 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install library stack system until building is enclosed, wet work and utility roughing-in are complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.



1.12 COORDINATION

- A. Coordinate layout and installation of framing and reinforcements for support of library stack system.
- B. Coordinate size, location, and requirements of the following:
  - 1. Overhead equipment supports.
  - 2. Shelving base supports.
  - 3. Integration of shelving with raised flooring system.
- C. Sequencing: Coordinate shelving installation with requirements of related work.

1.13 WARRANTY

- A. Submit a written warranty, executed by Contractor, Installer and Manufacturer, agreeing to repair or replace.
- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace units that fail in materials or workmanship within the specified warranty period. This warranty shall be in addition to, not limitation of other rights the Owner may have against the Contractor under Contract Documents.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Failure of operating components.
  - 2. Warranty Period: Five years from date of Substantial Completion for defects in materials.
  - 3. Warranty Period: One year from date of Substantial Completion for workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. The Ross McDonald Company/MJ Industries System 300 Shelving Systems and Library Furnishings.
  - 2. Montel, Inc./Aetnastak, Represented by The Corner Office Inc.
  - 3. Spacesaver, Systems and Space.
  - 4. Accepted equivalent.

2.2 LEED MATERIAL REQUIREMENTS, GENERAL

- A. Recycled Content: Use materials and products that contain the maximum amount of postconsumer recycled content plus one-half of preconsumer recycled content that retains material integrity.

- B. VOC Content: Adhesives and sealants applied on-site on the interior of the building and products used on the interior of the building shall comply with VOC limits as specified in Section 01 35 13.20 - Sustainable Design Requirements.
  - 1. Use materials that have the lowest possible VOC content in units of g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## 2.3 MATERIALS

- A. Sheet Steel: ASTM A366, cold-rolled sheet, commercial quality, Class 1, matte finish, stretcher-leveled, free of scale and imperfections, with consistent texture and smoothness.
- B. Fasteners: Cadmium-plated or zinc-plated steel, manufacturer's standard types and sizes.

## 2.4 BOOKSTACK RANGE UNITS

- A. Types and Sizes: As indicated on Drawings.
- B. Construction: Fabricate individual units with support provided by columns slotted to receive cantilevered shelves which are completely adjustable in 1-inch increments.
  - 1. Freestanding Ranges: Fully welded construction for rigidity.
  - 2. Provide marks every three inches to facilitate visual positioning and adjustment of shelves.
- C. Components:
  - 1. Upright posts.
  - 2. Bottom spreader channels.
  - 3. Top spreader tubes.
  - 4. Closed base shelf.
  - 5. Base shelf supports.
  - 6. Shelf brackets.
  - 7. Slotted multimedia display shelf
  - 8. Single tier pull-out multimedia browsing box
  - 9. Hinged periodical adjustable display shelves
  - 10. Canopy tops: **See Section 06 41 00. [Addendum 4]**
  - 11. End panels: **See Section 606 41 00. [Addendum 4]**
  - 12. Wall angles
  - 13. Intermediate wall and corner fill panels.
  - 14. **Mobile shelving on concealed casters. [Addendum 4]**
    - a. **Basis-of-Design: MJ Industries System 30 Cantilever Library Shelving with Concealed Caster units. [Addendum 4]**

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine subfloor surfaces, with installer present, for compliance with requirements for installation tolerances, setting conditions, dimensions, and other conditions affecting performance of fixed storage units.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of fixed storage units.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. After installation of flooring is complete, install units at locations shown, in continuous ranges made up of number of units shown, complying with manufacturer's instructions.
  1. Provide spacer washers which protect finish at fasteners through finished surfaces.
  2. Comply with Quality Assurance requirements for anchoring bookstacks to withstand seismic loads.
- B. Set units plumb and level, using adjustable leveling devices.
- C. Install shelves at spacing indicated, or if not indicated, at equal spacing in each unit.
- D. Install accessory items in locations indicated.

### 3.3 ADJUSTING AND CLEANING

- A. Verify moving parts are operating freely.
- B. Remove and replace components that are chipped, scratched, or otherwise damaged and which do not match adjoining work. Provide new matching units, installed as specified and in manner to eliminate evidence of replacement.
- C. Construction Waste Management: Manage construction waste in accordance with provisions of Section [ADDENDUM 3] 01 35 13.26 Construction Waste Management. Submit documentation for Credit MRc 2 to satisfy the requirements of that Section.
- D. Cleaning: Immediately upon completion of installation, clear components and surfaces. Remove surplus materials, rubbish and debris resulting from installation upon completion of work and leave areas of installation in neat, clean condition.
- E. Clean exposed surfaces and touch-up marred finishes or replace components as necessary to eliminate damage and indications of deterioration.

### 3.4 PROTECTION

- A. Protect library shelving system installation from damage during remainder of construction and until substantial completion.
- B. Replace components damaged prior to Substantial Completion.

END OF SECTION 11 51 23

SECTION 12 93 00 – SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

This Section includes the following:

- 1. Benches
- 2. Drinking Fountain
- 3. Sand Play Element
- 4. **[Addendum 4] Storage Sheds**
- 5. **[Addendum 4] Bike Racks**

- B. Related Sections include the following:

- 1. Division 03 Section "Cast-in-Place Concrete" for installation of pipe sleeves cast in concrete footings.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For units with factory-applied color finishes.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
  - 1. Size: Not less than 6-inch- long linear components and 4-inch- square sheet components.
- D. Material Certificates: For site furnishings, signed by manufacturers.
- E. Maintenance Data: For site furnishings to include in maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials against sun, weather and contact with damp or wet surfaces. Provide for air circulation within and around packaging and under temporary coverings.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:
1. Rolled or Cold-Finished Bars, Rods, and Wire: ASTM B 211 (ASTM B 211M).
  2. Extruded Bars, Rods, Wire, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
  3. Structural Pipe and Tube: ASTM B 429.
  4. Sheet and Plate: ASTM B 209 (ASTM B 209M).
  5. Castings: ASTM B 26/B 26M.
- B. Steel and Iron: Free of surface blemishes and complying with the following:
1. Plates, Shapes, and Bars: ASTM A 36/A 36M.
  2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53, or electric-resistance-welded pipe complying with ASTM A 135.
  3. Tubing: Cold-formed steel tubing complying with ASTM A 500.
  4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513, or steel tubing fabricated from steel complying with ASTM A 1011/A 1011M and complying with dimensional tolerances in ASTM A 500; zinc coated internally and externally.
  5. Sheet: Commercial steel sheet complying with ASTM A 1011/A 1011M.
  6. Perforated Metal: From steel sheet not less than 0.1196-inch (3.0-mm)]nominal thickness; manufacturer's standard perforation pattern.
  7. Expanded Metal: Carbon-steel sheets, deburred after expansion, and complying with ASTM F 1267.
  8. Malleable-Iron Castings: ASTM A 47/A 47M, grade as recommended by fabricator for type of use intended.
  9. Gray-Iron Castings: ASTM A 48/A 48M, Class 200.
- C. Stainless Steel: Free of surface blemishes and complying with the following:
1. Sheet, Strip, Plate, and Flat Bars: ASTM A 666.
  2. Pipe: Schedule 40 steel pipe complying with ASTM A 312/A 312M.
  3. Tubing: ASTM A 554.
- D. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials commercial quality tamperproof, vandal and theft resistant, concealed, recessed, and capped or plugged.
1. Angle Anchors: For inconspicuously bolting legs of site furnishings to on grade substrate; extent as indicated.
  2. Antitheft Hold-Down Brackets: For securing site furnishings to substrate;] [extent as indicated on Drawings.
- E. Non-shrink, Nonmetallic Grout: Premixed, factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107; recommended in writing by manufacturer, for exterior applications.
- F. Erosion-Resistant Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create

pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.

- G. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:
1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil (0.0076 mm) thick.
  2. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M.

## 2.2 SEATING

- A. Bench:
1. Basis-of-Design Product: DuMor Bench No. 270-60i, with end armrests, or approved equal.
    - a. Surface mount.
    - b. Material: Ipe Wood and steel.
    - c. **[Addendum 4] Color:**
      - 1) **At play area, custom RAL#6034 (provide sample for Owner's Representative's approval)**
      - 2) **All others, manufacturer's standard black**
    - d. Quantity: See plans.
    - e. Contact: Rebecca Whitten, Ross Recreation  
<http://dumor.com/products>  
415-453-6020, [rebeccaw@rossrec.com](mailto:rebeccaw@rossrec.com)

## 2.3 DRINKING FOUNTAIN

- A. Drinking Fountains:
1. Basis-of-Design Product: MDF (Most Dependable Fountains, Inc.), Model 440SMSS, with Surface Carrier, **[Addendum 4] Bowl Sand Strainer and Jug Filler**, or approved equal.
    - a. Material: Stainless Steel
    - b. **[Addendum 4] Color:**
      - 1) **At play area, custom RAL#6034 (provide sample for Owner's Representative's approval)**
      - 2) **All others, manufacturer's standard black**
    - c. Quantity: See plans
    - d. Contact: MDF, 1(800) 552-6331, [www.mostdependable.com](http://www.mostdependable.com)

2.4 SAND PLAY ELEMENT

A. [Addendum 4] Sand Play Element:

1. **Basis-of-Design Product:** Kaplan Full Size Deluxe Sand or Water Play Table with Top, Item # 15854, with 9" deep plastic tub with a unique drain, two-piece top that hooks on the side for easy storage, handles on each end and heavy-duty casters on all four legs for easy mobility, or approved equal.
  - a. **Material:** Birch
  - b. **Color and Finish:** Natural
  - c. **Quantity:** See plans
  - d. **Contact:** Kaplan Early Learning Company  
800-452-7526  
<https://www.kaplanco.com/product/15854/full-size-deluxe-sand-or-water-play-table-with-top?green=2975D7F0-3835-5DAF-0DDB-87562AF3B141>

2.5 [ADDENDUM 4] STORAGE SHED

A. Storage Shed

1. **Basis-of-Design Product:** Tuff-Shed "Garden Hutch" model, or approved equal, including
  - a. **Door on Side B** with hinges on the right and security package
  - b. **Metal Roof**
  - c. **Painted Finish**
2. **For bidding purposes, assume:**
  - a. **Three 24" deep shelves** along the entire length of the long wall
  - b. **Pegboard panels and hooks** covering both short walls
3. **Colors:**
  - a. **Metal Roof:** to be selected from manufacturer's standard colors (provide samples for selection)
  - b. **Siding, Trim and Doors**
4. **Quantity:** 2
5. **Contact:** TuffShed, 1-800-BUY-TUFF, [www.tuffshed.com](http://www.tuffshed.com)

2.6 [ADDENDUM 4] BIKE RACK

- A. **Bike Rack:** Basis of Design Project: "Bola" by Landscape Forms, Inc., or approved equal with double-side parking; designed to accommodate no fewer than two bicycles.
- B. **Material:** 304 Stainless Steel, not less than 1.5 inches OD; Wall thickness: .12 inches
- C. **Stainless-Steel Finish:** Electropolish finish.
- D. **Contact:** Landscape Forms, (800) 521-2546, [www.landscapeforms.com](http://www.landscapeforms.com); e-mail: [specify@landscapeforms.com](mailto:specify@landscapeforms.com)

2.7 FABRICATION

- A. **Metal Components:** Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.

- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWPAC M4 to cut surfaces.
- E. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- F. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

## 2.8 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.9 ALUMINUM FINISHES

- A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

## 2.10 STEEL AND GALVANIZED STEEL FINISHES

- A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.
- B. PVC Finish: Manufacturer's standard, UV-light stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added; complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness.



2.11 IRON FINISHES

- A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.12 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch (19 mm) larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

- F. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with non-shrink, nonmetallic grout mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

**3.4 ADJUSTING**

- A. Replace elements that are damaged or do not comply with requirements. Adjust joinery for uniform appearance.

**3.5 CLEANING**

- A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.
- B. Leave area of work broom clean.

**3.6 PROTECTION**

- A. Protect installed products from damage from weather and other causes during remainder of the construction period.

**END OF SECTION 12 93 00**

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SECTION 22 00 00 - PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. The General Conditions, Supplementary Conditions, and Division 1 General Requirements apply to the work specified in this Section.

1.2 SUMMARY

- A. Section includes: The work shall consist of furnishing all labor, material, and equipment required to complete the installation of the plumbing systems as indicated on the Drawings and described herein, including all incidental work necessary to make it complete and satisfactory and ready for operation. Work shall include but not be limited to the following principal items:
  - 1. Soil, waste, and vent piping inside the building to 5'- 0" outside the building.
  - 2. Kitchen waste piping inside the building to the connection to the grease interceptor outside the building.
  - 3. Rainwater leader and overflow drainage piping inside the building to 5'- 0" outside the building.
  - 4. Cold water, hot water and hot water return piping inside the building to 5'- 0" outside the building, including hot water heaters and recirculating pumps.
  - 5. Condensate drain piping - cooling coils.
  - 6. Condensate drain piping - condensing water heaters.
  - 7. Natural gas piping inside the building to the connection to the gas meter including coordination with the gas utility on the gas meter and related requirements.
  - 8. Condensing water heater flue and combustion air piping.
  - 9. Plumbing fixtures and trim, including required backing.
  - 10. Connection to mechanical equipment.
  - 11. Connection to food service equipment specified elsewhere including specified trim.

1.3 RELATED WORK

- A. Electrical, Division 26.
- B. Heating, Ventilating and Air Conditioning Systems, Section 23 00 00.
- C. Fire Sprinkler Systems, Section 21 13 00.
- D. Water Utilities, Section 33 10 00.
- E. Sanitary Sewage Utilities, Section 33 30 00.
- F. Storm Drainage Utilities, Section 33 40 00.
- G. Bioretention Areas, Section 33 44 02.

- H. Earthwork, Section 31 00 00.
- I. Trenching And Backfill, Section 31 23 16
- J. Manufactured Fireplaces, Section 10 31 00
- K. Food Service Equipment, Section 11 40 00.
- L. General Commissioning Requirements, Section 01 91 13.

1.4 LEED REQUIREMENTS

- A. Refer to Section 01 35 13.20 for LEED requirements relating to this section.

1.5 GENERAL REQUIREMENTS

- A. Verification of Conditions
  - 1. Prior to installation of plumbing work, Contractor shall inspect all surfaces to receive said work and arrange with the General Contractor for the satisfactory correction of all defects in workmanship and/or material that could interfere with the work specified herein.
  - 2. Installation of any plumbing work or materials on any surface shall constitute acceptance by the Contractor of such surfaces as being in proper condition to receive herein specified materials.
- B. Examination of site: Examine site prior to bidding. Compare it with drawings and specifications. Check conditions and take measurements, which may affect work. No allowance shall subsequently be made for any extra expense due to failure to make such examination.
- C. Manufacturer's directions: Follow manufacturer's directions covering points not shown on the drawings or specified herein. Manufacturer's directions do not take precedence over drawings and specifications. Where these are in conflict with drawings and specifications, notify Architect for clarifications before installing the work.
- D. Codes: Work and materials shall be in full compliance with all applicable local or state ordinances, California Building Code, California Plumbing Code, National Fire Protection Association, State of California Safety Orders, and State Fire Marshal. Whenever drawings and specifications require larger sizes or higher standards than are required by regulations, drawings and specifications govern. Whenever drawings or specifications require something which will violate regulations, regulations govern. No extra charge will be paid for furnishing items required by regulations but not specified or shown on drawings.
- E. Cooperation with other trades: Schedule work and cooperate with other divisions to avoid delays, interferences and unnecessary work, conforming to construction schedule, making installation when and where required. A special effort shall be made to coordinate with the Mechanical Contractor so as not to block installation of the mechanical systems. The clearances above ceilings on this project are limited and the ductwork and piping are to have the highest priority. All plumbing work is to be coordinated with the Mechanical Contractor such that the ductwork and piping can be installed in the locations shown on the

mechanical drawings. If installed work is later found to interfere with work of other divisions, make all necessary changes at Contractor's expense.

- F. Licenses, permits, services, and fees: Secure and pay for all licenses required to begin, perform, and complete work.
- G. Quietness of operation: Adjust, repair, or replace any equipment producing objectionable noise or vibration in any occupied areas of building, including providing additional brackets, bracing, etc., to prevent objectionable noise or vibration.
- H. Welder's qualifications: All welding must be performed by registered welders qualified to perform welding operations in accordance with ASME Code Standards.
- I. All components of the cold water system are to be in full compliance with CA AB 1953.

**1.6 SUBMITTALS**

- A. When specific names are used in connection with materials, they are used as standards only, but this implies no right to use other materials or methods unless approved by the Architect.
- B. Decision of the Architect shall govern as to what materials are acceptable substitutions. Burden of proof as to equality of any proposed fixtures, material, or equipment shall be upon the Contractor. Petition in favor of proposed substitute materials shall be made directly by the Contractor. If any tests are necessary to determine quality of proposed items, such tests shall be made at the expense of the Contractor by an unbiased laboratory satisfactory to the Architect.
- C. Submit shop drawings and material list in six (6) copies. Submit shop drawings and material list after official award of contract. Obtain approval of the Architect before installation. Shop drawings shall be submitted for all materials, equipment, and controls.
- D. Check shop drawings and submittals before forwarding to Architect and ascertain that all information submitted meets the requirements of drawings and specifications and conform to structural space conditions.
- E. Shop drawings also shall be prepared for modifications to architectural, plumbing, electrical, and mechanical work required by proposed materials - i.e., relocation of drains, revised electrical circuits, relocation of penetrations, etc.
- F. Installation of any approved substituted equipment is the Contractor's responsibility and any changes required to work included under other sections for installation of approved substituted equipment must be made to the satisfaction of the Architect and without any additional cost. Approval by Architect of substituted equipment and/or dimension drawings does not waive these requirements.
- G. Review of drawings and materials submitted for approval shall not be construed as a complete check or constitute a waiver of the requirements of the drawings and specifications. This review shall not relieve the Contractor of the responsibility to fit the proposed materials to the spaces provided and to effect necessary rearrangement or construction of other work. Contractor agrees that shop drawing submittals processed by

the Architect do not become contract documents and are not change orders; that the purpose of the shop drawing review is to establish a reporting procedure and is intended for the Contractor's convenience in organizing his work and to permit the Architect to monitor the Contractor's progress and understanding of the design. If deviations, discrepancies, or conflicts between shop drawing submittals and the contract documents are discovered either prior to or after the shop drawing submittals are processed by the Architect, the Contractor agrees that the contract documents shall control and shall be followed.

- H. Submittal lists shall include the identifying marks assigned to the items. Give name of manufacturer, brand name, and catalog number of each item. Submit complete list at one time with items arranged and identified in numerical sequence within each section and article specifications. Listing items "as specified" without both make and model or type designation is not acceptable, except as noted. Only pipe and fittings not specified by brand names may be listed "as specified" without manufacturer's name, provided proposed materials comply with specification requirements.
- I. Descriptive Data: Submit complete description, information and performance data covering equipment that is specified but for which catalog plate numbers, brand names, or specific models have not been used.
- J. Submittal of substitutions shall be limited to one proposal for each type or kind of item, unless otherwise permitted by the Architect.
- K. Also comply with the requirements of Division 1- General Requirements.

**1.7 DRAWINGS, SPECIFICATIONS, AND COORDINATION OF WORK**

- A. Drawings are essentially diagrammatic. Size and locations of equipment are generally shown to scale. Make use of data in all contract documents, and verify this information against field conditions.
- B. The drawings indicate the required size and point of termination of ductwork, pipes, and equipment. Install pipe with all necessary offsets and fittings to conform to the structure, avoid obstructions, preserve headroom, maintain required accessibility, and satisfy the requirements of the governing codes and the standards of good practice.
- C. The architectural and structural drawings and specifications take precedence over the mechanical drawings in the representation of the general construction work. Refer to the drawings, specifications, and review shop drawings for all work in order to coordinate plumbing work with the other work of the project.
- D. Where changes in indicated locations or arrangements are necessary due to conditions in building construction, interference with work in other divisions, or conflict in location, make changes at no cost to the Owner. Deviations, offsets, rises or drops in piping that may be necessary, whether shown or not, shall be made at no expense to Owner.
- E. Bring discrepancies between different drawings, between drawings and actual field conditions, or between drawings and specifications promptly to the attention of the Architect for decision, and stop all work on affected areas subject to resolution of the conflict.

**1.8 MATERIALS AND WORKMANSHIP**

- A. All materials and equipment to be new and in perfect condition. Materials or equipment for similar uses are to be of same type and manufacturer.
- B. Workmanship shall be of best standard practice of the trade.

**1.9 PROTECTION OF EQUIPMENT**

- A. The Contractor shall be responsible for damage to any of the work of this section until final acceptance. Cover all openings, apparatus, equipment, and appliances both before and after being set in place to prevent misuse or disfigurement of the apparatus, equipment, or appliances.

**1.10 OPENINGS**

- A. The Contractor shall cooperate with other trades in providing information for openings required in walls, floors, and roof for pipe and equipment.
- B. The Contractor shall pay all extra costs for cutting of openings as a result of incorrect, delayed, or neglected information.
- C. Make absolutely watertight any openings through waterproofed construction caused by the penetration of piping and in a manner approved by the Architect.

**1.11 CLEAN-UP**

- A. Thoroughly clean all parts of the apparatus and equipment. Exposed parts which are to be painted shall be thoroughly cleaned and all grease and oil spots removed with cleaning solvent.
- B. Inside all of pipes, ducts, etc., shall be flushed or cleaned before being placed on operation, and all strainers shall be cleaned after operational tests.
- C. Remove all debris and surplus equipment and leave installation in perfect condition ready for use.

**1.12 CONSTRUCTION REVIEW**

- A. All services rendered by the Architect or any of his consultants consist of professional opinions and recommendations made in accordance with generally accepted engineering practice.
- B. Under no circumstances is it the intent of the Architect or any of his consultants to directly control the physical activities of the Contractor or the Contractor's workmen in the accomplishment of work on this project.
- C. The presence of the field representative of the Architect or any of his consultants at the site is to provide to the Owner and/or Architect an additional source of professional advice, opinions, and recommendations based upon the field representative's observations.



1.13 SAFETY

- A. In accordance with generally accepted construction practices, the Contractor will be solely and completely responsible for conditions on the jobsite, 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.
- B. Construction review by the Architect or any of his consultants is not intended to include review of the adequacy of the Contractor's safety measures in, on, or near the construction site or at any other location.

1.14 OPERATING INSTRUCTIONS

- A. Upon completion of work, the Contractor shall place a competent person in charge who will operate the system and instruct the Owner's representative in all details of the operation and maintenance of the plumbing system.
- B. The Contractor shall carefully prepare four (4) descriptive booklets of the entire plumbing systems and a full description of the operation and maintenance of each piece of equipment.
- C. Operating instruction manuals are to include names, addresses, and telephone numbers for the following: project name, Owner, General Contractor, Plumbing Subcontractor, and equipment manufacturer's (including local representatives).
- D. Also comply with the requirements of Division 1 - General Requirements.

1.15 GUARANTEE

- A. The Contractor shall furnish a written guarantee to the Owner that the new materials, equipment, and installation are new, free from mechanical defects, noiseless, and are in perfect operating condition.
- B. The Contractor shall guarantee to replace and repair at his own expense any and all unsatisfactory and defective work and items to the satisfaction of the Owner for a period of one (1) year after the completion of commissioning. Also see section 01 91 13.
- C. The Contractor shall also furnish the Owner with all manufacturer's written guarantees of materials and equipment.
- D. Also comply with the requirements of Division 1 - General Requirements.

1.16 RECORD DRAWINGS

- A. Record drawings are to include all changes made during construction from the design drawings. The record drawings are to show the changes as mark-ups on the design drawings. Shop drawings or CAD drawings will not be accepted as record drawings.
- B. Also comply with the requirements of Division 1 - General Requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Soil, waste and vent piping:

1. Above Grade: No-hub cast iron soil pipe and fittings. All pipe and fittings shall conform to CISPI 301, ASTM 888 or ASTM A-74 standards. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute. Pipe and fittings are to be manufactured by AB&I Foundry, Charlotte Pipe, Tyler Pipe or equal. Joints shall be made with No-hub couplings with neoprene gasket, stainless shield and clamp, Tyler pipe, or equal.
2. Below Grade: No-hub cast iron soil pipe and fittings. All pipe and fittings shall conform to CISPI 301, ASTM 888 or ASTM A-74 standards. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute. Pipe and fittings are to be manufactured by AB&I Foundry, Charlotte Pipe, Tyler Pipe or equal. Joints shall be made with heavy duty No-hub couplings with neoprene gasket, stainless shield and clamps. Couplings shall be constructed of type 304 stainless steel with 305 stainless steel worm drive screws. Gaskets per ASTM C564. (4 band 80 inch pound torque). Mission Heavy Weight, Husky SD4000, or equal.

B. Kitchen waste piping:

1. Above grade: No-hub cast iron soil pipe and fittings. All pipe and fittings shall conform to CISPI 301, ASTM 888 or ASTM A-74 standards. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute. Pipe and fittings are to be manufactured by AB&I Foundry, Charlotte Pipe, Tyler Pipe or equal. Joints shall be made with No-hub couplings with neoprene gasket, stainless shield and clamp, Tyler pipe, or equal.
2. Below grade: No-hub cast iron soil pipe and fittings. All pipe and fittings shall conform to CISPI 301, ASTM 888 or ASTM A-74 standards. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute. Pipe and fittings are to be manufactured by AB&I Foundry, Charlotte Pipe, Tyler Pipe or equal. Joints shall be made with heavy duty No-hub couplings with neoprene gasket, stainless shield and clamps. Couplings shall be constructed of type 304 stainless steel with 305 stainless steel worm drive screws. Gaskets per ASTM C564. (4 band 80 inch pound torque). Mission Heavy Weight, Husky SD4000, or equal.

C. Rainwater leader and overflow drainage piping:

1. Above grade: No-hub cast iron soil pipe and fittings. All pipe and fittings shall conform to CISPI 301, ASTM 888 or ASTM A-74 standards. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute. Pipe and fittings are to be manufactured by AB&I Foundry, Charlotte Pipe, Tyler Pipe or equal. Joints shall be made with No-hub couplings with neoprene gasket, stainless shield and clamp, Tyler pipe, or equal.
2. Below grade: No-hub cast iron soil pipe and fittings. All pipe and fittings shall conform to CISPI 301, ASTM 888 or ASTM A-74 standards. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute. Pipe and fittings are to be manufactured by AB&I Foundry, Charlotte Pipe, Tyler Pipe or equal. Joints shall be made with heavy duty No-hub couplings with neoprene gasket, stainless shield and clamps. Couplings shall be constructed of type 304 stainless

steel with 305 stainless steel worm drive screws. Gaskets per ASTM C564. (4 band 80 inch pound torque). Mission Heavy Weight, Husky SD4000, or equal.

- D. Cold water, hot water and hot water return piping:
  - 1. Above grade: Type L copper tubing ANSI H23.1 with wrought copper sweat fittings ANSI B16.22 joined with lead free solder.
  - 2. Below grade: Type L copper tubing ANSI H23.1 with wrought copper sweat fittings ANSI B16.22 joined with lead free solder.
- E. Condensate drain piping - cooling coils:
  - 1. Type M copper tubing ANSI H23.1 with wrought copper sweat fittings ANSI B16.22 joined with lead free solder.
- F. Condensate drain piping - condensing water heater:
  - 1. Condensate piping from the condensing water heater is to be Schedule 40 PVC pipe and fittings with solvent weld joints.
  - 2. Provide factory neutralizer with lime chips for each condensing furnace and condensing water heater. Installer neutralizer in strict accordance with the manufacturer's installation instructions.
- G. Condensing water heater flue and combustion air piping:
  - 1. Flue and combustion air piping for the condensing water heaters shall be schedule 40 PVC pipe and fittings with solvent weld joints.
- H. Natural gas piping:
  - 1. Above grade: Schedule 40 black steel pipe ANSI B125.2 and 150 psi black malleable iron screwed fittings ANSI B16.3 for piping 2" and smaller. Pipe and fittings outside of buildings are to be galvanized. Wrap below grade piping per AWWA HOC 203.
- I. Unions and flanges:
  - 1. Steel pipe unions: Malleable iron ground joint pattern with brass to iron seats, 150 psi.
  - 2. Steel pipe flanges: ANSI B16.0, 150 psi forged steel welding type with flat face.
  - 3. Copper tubing unions: 150 psi ground joint cast bronze unions with sweat connections.
  - 4. Copper tubing flanges: ANSI B16.24, bronze, 150 psi to match standard ASA 150 psi steel flanges with flat face.
  - 5. Flange gaskets: Crane Co Cranite, 1/16" full face sheet packing, 150 psi. Coat gaskets with thread lubricant before installation.
- J. Dielectric protection:
  - 1. Location: For connection between dissimilar metals in the piping systems to control corrosion caused by galvanic or electrolytic action.
  - 2. Listing: Victaulic Style 47, Lochinvar V-line, or equal.
  - 3. Insulated couplings: Threaded for sizes 2" and smaller, grooved or flanged for 2-1/2" and larger.
- K. Thread lubricant for steel pipe: Amite Joint Seal Compound No. 250. or equal.

- L. Valves: Shall be a product of single manufacturer, Red-White or equal.
  - 1. Check valves (threaded): #236, bronze swing check, 125 psi.
  - 2. Check valves (solder): #237, bronze swing check, 125 psi.
  - 3. Ball valves (threaded): #5092, bronze, 125 psi.
  - 4. Ball valves (solder): #5095, bronze, 125 psi.
  - 5. Valves shall be same size as line in which they are installed. No valve shall be installed with stem pointed below horizontal.
- M. Pipe sleeves: Core holes with rotary diamond tooth core drills.
- N. Seismic bracing: Conform to SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems, Second Edition, 1998.
- O. Pipe hangers and supports: Superstrut or equal.
  - 1. Plumbing piping - soil, waste, vent, rainwater leader and overflow drain piping:
    - a. Conform to ASME B31.9.
    - b. Hangers for pipe sizes 1/2 inch to 1-1/2 inches: Malleable iron, adjustable swivel, split ring.
    - c. Hangers for pipe sizes 2 inches and over: Carbon steel, adjustable, clevis.
    - d. Multiple or trapeze hangers: Steel channels with welded spacers and hanger rods.
    - e. Copper pipe support: Carbon steel ring, adjustable, copper plated.
  - 2. Plumbing piping - cold water, hot water and hot water return piping:
    - a. Conform to ASME B31.9.
    - b. Hangers for pipe sizes 1/2 inch to 1-1/2 inches: Malleable iron, adjustable swivel, split ring.
    - c. Hangers for pipe sizes 2 inches and over: Carbon steel, adjustable, clevis.
    - d. Multiple or trapeze hangers: Steel channels with welded supports and hanger rods.
    - e. Copper pipe support: Carbon steel ring, adjustable, copper plated.
- P. Cleanouts:
  - 1. Zurn, Josam, J.R. Smith or equal, as scheduled on drawings. Cleanouts shall be furnished with flashing collars when installed in membraned slabs. Furnish suitable wrought iron or steel wrenches for each style of cleanout plug cap.
  - 2. Cleanouts at interior finished floor areas:
    - a. Lacquered cast iron with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.
  - 3. Cleanouts at interior finished wall areas:
    - a. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.
  - 4. Cleanouts at interior unfinished accessible areas:
    - a. Caulked or threaded type.
    - b. Provide bolted stack cleanouts on vertical rainwater leaders.
- Q. Drains: Zurn, Josam, J.R. Smith or equal, as scheduled on drawings. Drains shall be furnished with flashing collars when installed in membraned slabs. Furnish floor drains with trap primer connections. ASME A1123.6.3; lacquered cast iron two piece body with

double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

R. Insulation:

1. Hot water and hot water return piping:

a. **[Addendum 4] Above grade:**

- 1) Owens/Corning Fiberglass ASJ/SSL-II, or equal, heavy density, 2-piece sectional pipe insulation, jacketed with vapor barrier laminate, continuous pressure sealing adhesive lap and butt joint strip, 1-1/2" thick.
- 2) Apply insulation over clean, dry surfaces butting adjoining sections firmly together, seal smoothly and securely with self-sealing longitudinal lap. Adhere factory furnished 3" wide pressure sealing strips to joints.
- 3) Insulate fittings with fiberglass strips and finish with one-piece PVC fitting cover (Zeston).

b. **[Addendum 4] Below grade:**

- 1) **[Addendum 4] Pittsburgh Corning FOAMGLAS insulation, ASTM C 552 or equal with a thickness of 2" shall be provided.**
- 2) **[Addendum 4] Pittsburgh Corning PITTWRAP CW Plus or equal shall be factory applied to insulation in strict accordance with the manufacturer's installation instructions.**
- 3) **[Addendum 4] Pittsburgh Corning FOAMGLAS insulation and PITTWRAP CW Plus or equal are to be provided, stored, handled and installed in strict accordance with the manufacturer's installation instructions for direct burial to provide complete moisture protection for the piping.**

S. Piping identification:

1. Piping identification shall be manufactured by Marking Services, Incorporated or equal.
2. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.
3. Plastic nameplates: Laminated 3-layer plastic with engraved black 2 inch high letters on light contrasting background color.
4. Metal tags: brass aluminum with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
5. Plastic pipe markers: Factory fabricated, flexible, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed.

T. Plumbing fixtures:

1. Make and model as scheduled on the drawings or equal.
2. Fixtures and trim: As described in manufacturer's catalog with modifications noted.
3. Vitreous ware fixtures: White, twice-fired, vitreous china.
4. Fixture trim and exposed metal items: Chromeplated unless otherwise noted. Pipes passing through finished walls shall have chromeplated escutcheon plates.
5. Install stops in each water supply to fixtures.
6. No unoccupied fixture faucet holes shall be permitted.
7. Fit exposed fixture setting bolts with china caps.

8. Properly support and securely fasten all fixtures to adequate backing per manufacturer's recommendations.
  9. Point up joints between fixtures and wall or floors with white mastic. Mastic shall have sufficient resiliency to prevent cracking or pulling away from wall due to fixture movement.
  10. Rough-in and set fixtures to height shown on Architectural drawings or as standard for the industry.
- U. Escutcheon plates: For pipes passing through finished ceilings, walls, and floors in conspicuous locations, use chromium-plated steel floor and ceiling plates with set screw or other approved means of holding securely in place.
- V. Flashing and counterflashing: For cast iron pipe penetrations through roof, use 4 pound lead flashing with counterflashing. For copper pipe penetration through roof, use copper flashing and counterflashing. Follow the roofing manufacturer's recommendations for all roof penetrations, curbs, platforms, and sleepers.
- W. Access panels:
1. In areas other than toilet rooms: Karp Model DSC-214-M, or equal prime coated steel with 14 gauge door and trim and 16 gauge frame, continuous concealed piano hinge, flush screwdriver operated cam latch, size shall be 12"x12".
  2. In toilet rooms: Karp Model DSC-214-M, or equal, Type 304 stainless steel, continuous concealed piano hinge, flush screwdriver operated cam latch, size shall be 12"x12".
- X. Underground, uninsulated, steel pipe lines: Shall be wrapped conforming to AWWA HO C203.
- Y. Equipment scheduled on drawings:
1. Water closets.
  2. Urinals.
  3. Lavatories.
  4. Sinks.
  5. Mop sink.
  6. Drinking fountains.
  7. Drinking fountain/bottle filler.
  8. Floor drains.
  9. Floor sinks.
  10. Floor cleanouts.
  11. Grade cleanouts.
  12. Wall cleanouts.
  13. Hose bibbs.
  14. Wall boxes.
  15. Water hammer arrestor.
  16. Trap primer.
  17. Water heater (gas - condensing).
  18. Water heater (gas - non-condensing).
  19. Electric instantaneous water heater.
  20. Hot water recirculation pumps.

- 21. Grease interceptor.
- 22. Roof drains.
- 23. Overflow drains.

### PART 3 - EXECUTION

#### 3.1 GENERAL

- A. Support exposed and concealed piping on specified hangers properly spaced and set to allow piping to adjust for temperature change expansion and contraction. Evenly space and support piping in parallel.
- B. Install equipment, products and materials in complete accordance with the manufacturer's installation requirements and recommendations.
- C. Coordinate with other trades to provide continuous support channel for all pipes and conduit in exposed locations.
- D. Conceal piping in ceilings, furred walls, partitions and pipe spaces, except where noted otherwise. Provide maximum head room and run piping to maintain proper clearance for piping runs beforehand and with other divisions to ensure clearance. Where work of other divisions prevents installation of piping shown on drawings, reroute piping as directed by Architect at no extra cost to Owner.
- E. Install exposed piping parallel to or at right angles with building walls.
- F. No valve, piece of equipment, or trim shall support the weight of any pipe. Install valves, traps, cleanouts, etc., in accessible locations.
- G. Install piping free from traps and air pockets.
- H. Use special wrenches in assembly of polished, chrome-plated tubing and fittings so that no tool marks are left on pipe fittings.
- I. Wherever changes in sizes of piping occur, use reducing fittings.
- J. Install unions adjacent to threaded valves, equipment, and at other points where required for disassembly.
- K. Provide sleeves wherever pipes run through walls, slabs, beams, footing, and floors large enough for passage of pipe and/or pipe insulation. Sufficiently size sleeves to allow for contraction and expansion of pipe. Pack sleeves with approved packing material. Pack sleeves in walls and slabs below grade and through exterior walls above grade with waterproof mastic or grout.
- L. Set floor drains, floor cleanouts and floor sinks so top of plate and rim will be flush with top of finish flooring.

- M. Where sleeves are missed or misplaced during canning, core holes with rotary diamond tooth core drills.
- N. Fit exposed pipes which pass through walls, ceilings, or floors in finished rooms and conspicuous locations with escutcheon plates.
- O. Install insulating unions or flanges at ferrous and non-ferrous piping connections.
- P. Install water hammer arrestors at all locations of fast closing positive shut-off valves and equipment with fast closing or solenoid valves; including but not limited to flush valves, single handle faucets, dishwashers, etc. Install behind wall access panel with ball shut-off valve. Follow manufacturer's installation instructions for proximity to valve and specific configuration of inlet piping.
- Q. Install 12" long air chamber on hose bibbs and non-single handle faucets including, but not limited to, mop sink faucets.
- R. Install trap primers in complete accordance with the manufacturer's recommendations.
- S. Minimum bury for exterior piping: 30" below finish grade, except as otherwise noted or determined by invert elevations.
- T. Install water heaters in complete accordance with the manufacturer's installation instructions and recommendations.
- U. Provide maximum head room and run piping to maintain proper clearance for piping runs. Coordinate beforehand and with other divisions to insure clearance for mechanical duct, piping and equipment and required clearance above electrical panels or equipment has been provided.

### 3.2 PIPE HANGERS, SUPPORTS, AND BRACES

- A. General: Support piping from building structure so that there is no apparent deflection in piping runs. Fit piping with steel sway braces and anchors to prevent vibration and/or horizontal displacement under load when required. Support piping only by approved pipe hangers. Pipes shall not be supported from, or braced to, ducts, other pipes, conduits, or any materials except building structure. Piping or equipment shall not be supported or hung by wire, rope, plumbers tape, or blocking of any kind.
- B. Hanger spacing (not for piping or multiple piping supports):

<u>Type of Pipe</u>	<u>1-1/2" diam. &amp; smaller</u>	<u>2" diam. &amp; lgr</u>
Steel pipe	8'- 0"	10'- 0"
Copper tubing	6'- 0"	8'- 0"
Cast iron pipe	All sizes 5'- 0" max. and not less than one hanger per joint	
- C. Multiple piping support: 6'- 0"
- D. Support vertical piping at each floor level with riser clamps.



- E. Piping at completion of job shall be rigid and immobile. Install additional pipe supports, brackets, and hangers as required to accomplish a rigid and immobile piping system.
- F. Double wrap copper pipe with heavy vinyl tape where pipe comes in contact with ferrous materials.

**3.3 EXCAVATING, TRENCHING, AND BACKFILLING**

- A. Trenches: Shall have uniform grades. In case of over-excavation, fill to bottom of pipe with selected fill or sand. Provide dewatering pumping as required. Comply with Division 31 - Earthwork.
- B. Shoring: Comply with Division 31 - Earthwork.
- C. Cleaning of trenches: After pipe lines have been tested, inspected, and approved, and prior to backfilling, remove forms, trash, and debris from trenches, then backfill.
- D. Backfill and compaction: Comply with Division 31 - Earthwork.

**3.4 CLEANING**

- A. Thoroughly clean exterior and interior of piping, equipment, and materials before systems are put in operation. Clean plumbing fixtures with soap and water. Remove marks and labels. Clean and polish chrome. Remove paint, concrete, plaster, and other foreign materials. Clean valve handles and stems of any paint, dirt, or other foreign materials. Clean drains of dirt and debris. Remove shipping paper from cleanout covers and drain strainers and polish. Remove and clean out dirt and debris from pipe spaces, including wire and blocking.

**3.5 ADJUSTMENTS**

- A. Adjust water closet and urinal flush valves to provide proper flush. Adjust faucets to their normal working conditions.

**3.6 TESTING**

- A. Soil, waste and vent piping: Test with minimum height of stand pipe 10'-0". Test duration to be a minimum of four (4) hours.
- B. Rainwater leader and overflow drain piping: Test with minimum height of stand pipe 10'-0". Test duration to be a minimum of four (4) hours.
- C. Kitchen waste piping: Test with minimum height of stand pipe 10'-0". Test duration to be a minimum of four (4) hours.
- D. Cold water, hot water and hot water return piping: Hydrostatically test under a pressure of 150 psi at highest point for a minimum test duration of four (4) hours.
- E. Condensate drain piping - cooling coils: Test with minimum height of stand pipe 10'-0". Test duration to be minimum of four (4) hours.

- F. Condensate drain piping - condensing water heater: Test with minimum height of stand pipe 10'-0". Test duration to be a minimum of four (4) hours.
- G. Condensing water heater flue and combustion air piping: Test with air under pressure of 50 psi for a minimum test duration of four (4) hours.
- H. Natural gas piping: Test with air under pressure of 100 psi for a minimum test duration of four (4) hours.
- I. If systems are tested in sections, include connection to previously tested section. Final pressures at end of test period shall be no more nor less than that caused by expansion or contraction of test medium due to temperature changes. Apply tests for a minimum period of four (4) hours or as required by local codes or agencies having jurisdiction. Where testing pressures are higher than rated pressure for equipment, or special trim, remove and bypass item with temporary piping for purposes of test.

### 3.7 PIPING IDENTIFICATION

- A. Installation:
  - 1. Degrease and clean surfaces to receive adhesive for identification materials.
  - 2. Plastic nameplates: Install with corrosive-resistant mechanical fasteners or adhesive.
  - 3. Plastic or metal tags: Install with corrosive-resistant chain.
  - 4. Plastic pipe markers: Install in accordance with manufacturer's instructions. Maximum spacing is to be 20 feet on center.
  - 5. Valves: Identify valves in main and branch piping with tags.
  - 6. All exposed piping and piping above accessible ceilings shall be neatly identified spaced not more than twenty (20) feet on center.
  - 7. In addition to the maximum spacing listed above, labeling is to occur at each change of direction in piping and at each side of the wall where the piping penetrates a wall.

### 3.8 STERILIZATION OF WATER PIPING

- A. At the completion of all work and after the system is tested, flushed, and cleaned, all potable water lines shall be sterilized in accordance with local Department of Public Health, "AWWA" Standard C601, and the following:
  - 1. Water treatment firm shall be Bennett Marine Utility, Inc., Burlingame, California, or approved equal.
  - 2. A solution of sodium hypochlorite containing not less than 200 ppm of free chlorine shall be injected into the system in such a manner as to insure that the entire system is completely filled with the solution. During this procedure, all valves shall be operated and out-lets shall be tested for residual chlorine. Injection shall continue until all outlets indicate at least 200 ppm of free chlorine.
  - 3. After injection, the system shall be isolated and the solution held in retention for a period of not less than three (3) hours. Tests shall be made for residual chlorine for retention. If such tests indicate less than 200 ppm of residual chlorine, the entire procedure shall be repeated. After satisfactory sterilization has been effected, the system shall be flushed from an approved source, until all traces of chlorine have been removed or until the chlorine content is no greater than that in the existing supply.

4. A Certificate of Sterilization/Chlorination, together with bacteriological reports, shall be prepared by the water treatment firm and delivered to the Architect and mechanical engineer stating the work has been done in accordance with the specifications set forth above and prior to final acceptance by Owner.

END OF SECTION 22 00 00

SECTION 23 00 00 - HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. The General Conditions, Supplementary Conditions, and Division 1 General Requirements apply to the work specified in this Section.

1.2 SUMMARY

- A. Section Includes: The work shall consist of furnishing all labor, material, and equipment required to complete the installation of the heating, ventilating and air conditioning (HVAC) systems as indicated on the drawings and described herein, including all incidental work necessary to make it complete and satisfactory and ready for operation. Work shall include, but not be limited to, the following principal items:
1. Variable refrigerant flow (VRF) systems:
    - a. VRF outdoor units.
    - b. VRF fan coil units.
    - c. VRF branch circuit (BC) controllers.
    - d. VRF controls.
  2. Exhaust fans.
  3. Upblast exhaust fan.
  4. Kitchen exhaust fan.
  5. Gravity hoods.
  6. Split air conditioning system.
  7. Circulation fans.
  8. Refrigerant piping.
  9. Filters.
  10. Air distribution equipment including grilles, registers, and diffusers.
  11. Ductwork systems complete with necessary volume dampers, access doors, hangers, supports, and accessories for the following service:
    - a. Air supply.
    - b. Air return.
    - c. Air transfer.
    - d. Outside air intake.
    - e. General exhaust.
  12. Insulation and covering for piping, ductwork, and equipment.
  13. Access panels and doors in ductwork and plenums.
  14. Access panels in ceilings which relate to this trade, furnishing shop drawings, and coordination for the proper location of the panels.
  15. Miscellaneous, including instruments, sleeves, flashings, tags and marking, and all accessories and items necessary for a complete installation.
  16. Testing and adjusting all system components.
  17. Testing and balancing of all air systems.
  18. Connection to kitchen equipment specified elsewhere.
  19. Commissioning in coordination with Commission Authority.
  20. **[Addendum 4] Duct silencers.**

1.3 RELATED WORK

- A. Fire Sprinkler Systems, Section 21 13 00.
- B. Plumbing Systems, Section 22 00 00.
- C. General Commissioning Requirements, Section 01 91 13.
- D. Electrical, Division 26.
- E. Rough Carpentry, Section 06 10 00.
- F. Gypsum Board, Section 09 29 00.
- G. Access Doors, Section 08 31 13.
- H. Acceptance Requirements, Section 23 05 00.
- I. Food Service Equipment, Section 11 40 00.

1.4 LEED REQUIREMENTS

- A. Refer to Section 01 35 13.20 for LEED requirements related to this section.

1.5 GENERAL REQUIREMENTS

- A. Verification of Conditions: Prior to installation of HVAC work, inspect all surfaces to receive said work and arrange for the satisfactory correction of all defects in workmanship and/or material that could interfere with the work specified herein. Installation of any HVAC work or materials on any surface shall constitute acceptance of such surfaces as being in proper condition to receive herein specified materials.
- B. Codes: Work must comply with the Applicable Code Requirements.
- C. Reference standards: Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to work of this Section where cited below:
  - 1. Air Moving and Conditioning Association (AMCA).
  - 2. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE).
  - 3. American Society of Mechanical Architects (ASME).
  - 4. American Society of Plumbing Architects (ASPE).
  - 5. Associated Air Balance Council (AABC).
  - 6. National Electrical Manufacturers Association (NEMA).
  - 7. National Fire Protection Association (NFPA).
  - 8. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
  - 9. California Building Code (CBC).
  - 10. State of California - OSHA.
  - 11. California Mechanical Code (CMC).
  - 12. 2016 California Building Energy Efficiency Standards (Title 24).

13. State Fire Marshal requirements (SFM).
  14. Air Conditioning and Refrigeration Institute (ARI).
  15. State of California Environmental Quality Act.
  16. American Society of Testing and Materials (ASTM).
  17. Underwriters Laboratories (UL).
  18. Occupational Safety and Health Act (OSHA).
  19. National Bureau of Standards (NBS).
  20. American National Standards Institute (ANSI).
  21. AMCA Standard 99: Standards Handbook.
  22. AMCA/ANSI Standard 204: Balance Quality and Vibration Levels for Fans.
  23. AMCA Standard 210: Laboratory Methods of Testing Fans for Ratings.
  24. AMCA Standard 300: Reverberant Room Method for Sound Testing of Fans.
  25. AMCA Standard 500: Test Methods for Louvers, Dampers and Shutters.
  26. ARI Standard 410: Forced-Circulation Air-Cooling and Air-Heating Coil.
  27. ANSI/ASHRAE 15: Safety Code for Mechanical Refrigeration.
  28. ASHRAE Standard 52: Gravimetric and Dust Spot Procedures for Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter.
  29. ASHRAE/ANSI Standard 111: Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning and Refrigeration Systems.
  30. ASME Section VIII: Unified Pressure Vessel Code.
  31. UL Standard 1995: Heating and Cooling Equipment.
  32. ASTM A-525: Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
  33. ASHRAE Standard 62.1-2016: Ventilation For Acceptable Indoor Air Quality.
  34. ANSI/ASHRAE Standard 55-2013: Thermal Environmental Conditions for Human Occupancy.
  35. LEED 2009 for New Construction, Core & Shell, and Schools.
- D. Materials and workmanship:
1. All materials and equipment to be new and in perfect condition. Materials or equipment for similar uses are to be of same type and manufacturer.
  2. Workmanship shall be of best standard practice of the trade.
- E. Protection of equipment: The Contractor shall be responsible for any damage to any of the work of this Section until final acceptance. Cover all duct, pipe and equipment openings, and cover all apparatus, equipment, and appliances both before and after being set in place to prevent misuse or disfigurement of the apparatus, equipment, or appliances.
- F. Openings:
1. Cooperate with other trades in providing information as to openings required in walls, floors, and roof for ducts and equipment.
  2. Pay all extra costs for cutting of openings as a result of incorrect, delayed, or neglected information.
  3. Make absolutely watertight any openings through waterproofed construction caused by the penetration of ductwork or piping, in a manner approved by the Architect.
- G. Cleanup:

1. Thoroughly clean all parts of the apparatus and equipment. Exposed parts, which are to be painted shall be thoroughly cleaned of cement, plaster, and other materials, and all grease and oil spots removed with cleaning solvent.
2. Inside of all pipes, ducts, etc., shall be flushed or cleaned before being placed in operation, and all strainers shall be cleaned after operational tests.
3. Remove all debris and surplus equipment and leave installation in perfect condition ready for use.

H. Construction review:

1. All services rendered by the Architect or any of his consultants consist of professional opinions and recommendations made in accordance with generally accepted architectural practice.
2. Under no circumstances is it the intent of the Architect or any of his consultants to directly control the physical activities of the Contractor or the Contractor's workmen in the accomplishment of the work.
3. The presence of the field representative of the Architect or any of his consultants at the site is to provide to the Owner and/or Architect an additional source of professional advice, opinions, and recommendations based upon the field representative's observations.

I. Safety:

1. In accordance with generally accepted construction practices, the Contractor will be solely and completely responsible for conditions on the project site including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited by normal working hours.
2. Construction review by the Architect or any of his consultants is not intended to include review of the adequacy of the Contractor's safety measures in, on, or near the project site or at any other location.

J. Welder's Qualifications:

1. All welding must be performed by registered welders qualified to perform welding operations in accordance with ASME Code Standards.

1.6 SUBMITTALS

- A. When specific names are used in connection with materials, they are used as standards only, but this does not imply the right to use other materials or methods unless approved by the Architect.
- B. Decision of the Architect shall govern as to what materials are acceptable substitutions. Burden of proof as to equality of any proposed fixtures, material, or equipment shall be upon the Contractor. Petition in favor of proposed substitute materials shall be made directly by the Contractor. If any tests are necessary to determine equality of proposed items, such tests shall be made at the expense of the Contractor by an unbiased laboratory satisfactory to the Architect.
- C. Submit shop drawings and material list in six (6) copies. Submit material list and shop drawings after official award of contract. Obtain approval of the Architect before installation. Shop drawings shall be submitted for all materials, equipment, and controls.

- D. Check shop drawings and submittals before forwarding to Architect and ascertain that submittals meet all requirements of drawings and specifications and conform to structural conditions available.
- E. Shop drawings also shall be prepared for modifications to Architectural, structural, plumbing, electrical, and mechanical work required by proposed materials - i.e., relocation of drains, revised electrical circuits, relocation of penetrations, etc.
- F. Installation of any approved substituted equipment is the Contractor's responsibility, and any changes required to work included under other sections for installation of approved substituted equipment must be made to the satisfaction of the Architect and without any additional cost. Approval by Architect of substituted equipment and/or dimension drawings does not waive these requirements.
- G. Review of drawings and materials submitted for approval shall not be construed as a complete check or constitute a waiver of the requirements of the drawings and specifications but will indicate that the material submitted is acceptable in quality, utility, and capacity. This review shall not relieve the Contractor of the responsibility to fit the proposed materials to the spaces provided and to effect necessary rearrangement or construction of other work. Contractor agrees that shop drawing submittals processed by the Architect do not become contract documents and are not change orders; that the purpose of the shop drawing review is to establish a reporting procedure and is intended for the Contractor's convenience in organizing his work and to permit the Architect to monitor the Contractor's progress and understanding of the design. If deviations, discrepancies, or conflicts between shop drawing submittals and the contract documents are discovered either prior to or after the shop drawing submittals are processed by the Architect, the Contractor agrees that the contract documents shall control and shall be followed.
- H. Submittal lists shall include the identifying marks assigned to the items. Give name of manufacturer, brand name, and catalog number of each item. Submit complete list at one time with items arranged and identified in numerical sequence within each section and article of the specifications. Listing items "as specified" without both make and model or type designation is not acceptable except pipe and pipe fittings not specified by brand names, which may be listed "as specified" without manufacturer's name, provided proposed materials comply with specification requirements.
- I. Descriptive Data: Submit complete description, information, and performance data covering equipment which is specified but for which catalog plate numbers, brand names, or specific models have not been used. Include fan performance curves for all equipment with fans and for each individual fan submitted.
- J. Submittal of substitutions shall be limited to one (1) proposal for each type or kind of item, unless otherwise permitted by the Architect.
- K. Also comply with the requirements of Division 1 - General Requirements



**1.7 DRAWINGS, SPECIFICATIONS, AND COORDINATION OF WORK**

- A. Drawings are essentially diagrammatic. Size and locations of equipment are generally shown to scale. Make use of data in all contract documents, and verify this information against field conditions.
- B. The drawings indicate the required size and point of termination of ductwork, pipes, and equipment. Install pipe with all necessary offsets and fittings to conform to the structure, avoid obstructions, preserve headroom, maintain required accessibility, and satisfy the requirements of the governing codes and the standards of good practice.
- C. The architectural and structural drawings and specifications take precedence over the mechanical drawings in the representation of the general construction work. Refer to the drawings, specifications, and review shop drawings for all work in order to coordinate mechanical work with the other work of the project.
- D. Where changes in indicated locations or arrangements are necessary due to conditions in building construction, rearrangement of equipment, or conflict in location, make such changes at no cost to the Owner, provided that the change is ordered before pipe, ductwork and/or equipment is installed and that the length of run is not revised by more than five (5) percent of the indicated run.
- E. Bring discrepancies between different drawings, between drawings and actual field conditions, or between drawings and specifications promptly to the attention of the Architect for decision, and stop all work on affected areas subject to resolution of the conflict.

**1.8 OPERATING INSTRUCTIONS**

- A. Upon completion of the work, the Contractor shall place a competent person in charge who will operate the system and instruct the Owner's representatives in all details of the operation and maintenance of each piece of equipment and each system.
- B. The Contractor shall carefully prepare four (4) descriptive binders of the entire HVAC system and a full description of the operation and maintenance of each piece of equipment. The binders shall have tabs indicating each type of equipment with sub-dividers indicating the equipment symbol shown on the drawings. An index shall be provided with page numbers for each type of equipment and each piece of equipment. The binders shall be well organized to provide easy reference.
- C. Operating instruction manuals are to include names, addresses, and telephone numbers for the following: project name, Owner, Mechanical Contractor, and equipment manufacturers (including local representatives).
- D. Also comply with the requirements of Division 1 - General Requirements.

1.9 GUARANTEE

- A. This Contractor shall furnish a written guarantee to the Owner that the materials, equipment, and installation are new, free from mechanical defects, noiseless, and are in perfect operating condition.
- B. The Contractor shall guarantee to replace and repair at his own expense any and all unsatisfactory and defective work and items to the satisfaction of the Owner for a period of one (1) year after the completion of commissioning. Also refer to section 01 91 13.
- C. The Contractor shall also furnish the Owner with all manufacturer's written guarantees of materials and equipment.
- D. Also comply with the requirements of Division 1 - General Requirements.

1.10 RECORD DRAWINGS

- A. Record drawings are to include all changes made during construction from the design drawings. The record drawings are to show the changes as mark-ups on the design drawings. Shop drawings or CAD drawings will not be accepted as record drawings.
- B. The record drawings are to include the as-programmed EMTCS sequence of operations for all systems and equipment.
- C. Also comply with the requirements of Division 1 – General Requirements.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Access doors:
  - 1. General: All concealed equipment, valves, controls, fire/smoke dampers, volume dampers, etc., shall be provided with access doors which shall be furnished and installed by the general Contractor. Coordination for the location of access doors to ensure access to all HVAC equipment requiring access is the responsibility of this section of work. Access doors are not required in removable ceilings. Access doors which provide access to fire/smoke dampers are to be labeled with one-half inch (1/2") high letters reading "Fire/Smoke Damper."
  - 2. Access doors shall be bonderized steel, with flush screwdriver operated cam latch, fitted with concealed hinges, factory prime coated. Doors shall be Milcor, or approved equal, Style "A" for acoustical tile, Style "B" 6 for acoustical plaster, Style "K" for non-acoustical plaster, and Style "M" elsewhere, 24" square unless otherwise noted on the drawings. Access doors in 1 or 2-hour construction shall be Milcor or equal U/L "B" label doors.
- B. Air diffusers, grilles and registers:
  - 1. Provide opposed blade damper volume controls only where specifically
  - 2. scheduled on the drawings.
  - 3. Contractor to verify that the mounting frame of ceiling diffusers, grilles,

4. and registers matches the ceiling or wall system actually being installed.
5. Color to be standard off-white.
6. All air diffusers, grilles, and registers are to be as shown on the drawings.
7. Manufacturer: Titus, Price, or equal.

## 2.2 EQUIPMENT

### A. Variable refrigerant flow (VRF) system - Mitsubishi:

1. General:
  - a. System description:
    - 1) The variable refrigeration flow system shall be a Mitsubishi Electric CITY MULTI Variable Refrigerant Flow (VRF) system or equal. The CITY MULTI VRF systems shall be the R2-Series (simultaneous cooling and heating) split system heat pump.
    - 2) The R2-Series system shall consist of a PURY outdoor unit, Branch Circuit (BC) Controller, multiple indoor fan coil units, and M-NET Direct Digital Controls (DDC). Each indoor unit or group of indoor units shall be capable of operating in any mode independently of other indoor units or groups. System shall be capable of changing mode (cooling to heating, heating to cooling) with no interruption to system operation. To ensure power comfort, each indoor unit or group of indoor units shall be independently controlled and capable of changing mode automatically when zone temperature strays 1.8 degrees F from set point for ten minutes. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of outdoor rated capacity.
  - b. Quality assurance:
    - 1) The units shall be listed by Electrical Laboratories (ETL) and bear the ETL label.
    - 2) All wiring shall be in accordance with the National Electrical Code (N.E.C.).
    - 3) The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
    - 4) All units must meet or exceed the 2010 Federal minimum efficiency requirements and the proposed ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the DOE alternative test procedure, which is based on the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standards 340/360, 1230 and ISO Standard 13256-1.
    - 5) A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.
  - c. Delivery, storage and handling:
    - 1) Unit shall be stored and handled according to the manufacturer's recommendation.
  - d. Warranty:
    - 1) The units shall be covered by the manufacturer's extended limited warranty for a period of five (5) years from date of installation.
    - 2) The refrigeration compressors shall have a manufacturer's limited warranty for a period of seven (7) years from date of installation. If,

during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at no cost to the Owner.

- e. Qualifications of installer:
  - 1) The CITY MULTI VRF system shall be installed by a Mitsubishi authorized CITY MULTI Diamond Dealer with extensive CITY MULTI installation and service training with a minimum of two (2) installations completed of similar size and complexity to this project. The mandatory Contractor service and install training shall be performed by the manufacturer. The installing Contractor shall submit proof of participating in and successfully completing the manufacturer's training program prior to ordering any equipment or proceeding with any work on this project. The installing Contractor must also submit a list of the CITY MULTI VRF systems that they have installed.
- f. Manufacturer start-up services:
  - 1) An authorized representative of the VRF system manufacturer is to inspect the installation and control functioning of the variable refrigerant flow system and provide start-up services. The representative is to provide a letter certifying that the installation meets their requirements and that the variable refrigerant flow system is fully operational.
- 2. VRF outdoor units - Mitsubishi:
  - a. General:
    - 1) The VRF outdoor units shall be Mitsubishi PURY R-2 series or equal and shall be used specifically with CITY MULTI VRF components. The PURY outdoor units shall be equipped with multiple circuit boards that interface to the M-NET controls system and shall perform all functions necessary for operation. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.
      - a) All units requiring a factory supplied twinning kit shall be piped together in the field, without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the Contractor.
      - b) Outdoor unit shall have a sound rating no higher than 60 dB(A) individually or 63 dB(A) twinned. Units shall have a sound rating no higher than 50 dB(A) individually or 53 dB(A) twinned while in night mode operation. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the Contractor.
      - c) Both refrigerant lines from the outdoor unit to the BC (Branch Circuit) Controller (Single or Main) shall be insulated.
      - d) There shall be no more than 3 branch circuit controllers connected to any one outdoor unit.
      - e) Outdoor unit shall be able to connect to up to 50 indoor units depending upon model.
      - f) The outdoor unit shall have an accumulator with refrigerant level sensors and controls.

- g) The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.
  - h) The outdoor unit shall have the ability to operate with a maximum height difference of 164 feet and have total refrigerant tubing length of 1804-2625 feet. The greatest length is not to exceed 541 feet between outdoor unit and the indoor units without the need for line size changes or traps.
  - i) The outdoor unit shall be capable of operating in heating mode down to -4°F ambient temperature or cooling mode down to 23°F ambient temperature, without additional low ambient controls. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the Contractor.
  - j) The outdoor unit shall be provided with a manufacturer supplied 20 gauge hot dipped galvanized snow/hail guard. The snow/hail guard protects the outdoor coil surfaces from hail damage and snow build-up in severe climates.
  - k) The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.
  - l) Unit must defrost all circuits simultaneously in order to resume full heating more quickly. Partial defrost which may extend “no or reduced heating” periods shall not be allowed.
- b. Unit cabinet:
  - 1) The casing(s) shall be fabricated of galvanized steel, bonderized and finished.
- c. Fan:
  - 1) Each outdoor unit module shall be furnished with one direct drive, variable speed propeller type fan. The fan shall be factory set for operation under 0 in. WG external static pressure, but capable of normal operation under a maximum of 0.24 in. WG external static pressure via dipswitch.
  - 2) All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.
  - 3) All fan motors shall be mounted for quiet operation.
  - 4) All fans shall be provided with a raised guard to prevent contact with moving parts.
  - 5) The outdoor unit shall have vertical discharge airflow.
- d. Refrigerant:
  - 1) R410A refrigerant shall be required for PURY outdoor unit systems.
  - 2) Polyester (POE) oil shall be required. Prior to bidding, manufacturers using alternate oil types shall submit Material Safety Data Sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.
- e. Coil:
  - 1) The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.

- 2) The coil fins shall have a factory applied corrosion resistant blue-fin finish.
    - 3) The coil shall be protected with an integral metal guard.
    - 4) Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
    - 5) The outdoor coil shall include 4 circuits with two position valves for each circuit, except for the last stage.
  - f. Compressor:
    - 1) Each outdoor unit module shall be equipped with one inverter driven scroll hermetic compressor. Non inverter-driven compressors shall not be allowed.
    - 2) A crankcase heater(s) shall be factory mounted on the compressor(s).
    - 3) The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 19%-8% of rated capacity, depending upon unit size.
    - 4) The compressor will be equipped with an internal thermal overload.
    - 5) The compressor shall be mounted to avoid the transmission of vibration.
    - 6) Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.
  - g. Electrical:
    - 1) The outdoor unit shall be controlled by integral microprocessors.
    - 2) The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.
3. VRF branch circuit (BC) controllers - Mitsubishi:
  - a. General:
    - 1) The BC Controllers shall include multiple branches to allow simultaneous heating and cooling by allowing either hot gas refrigerant to flow to indoor unit(s) for heating or subcooled liquid refrigerant to flow to indoor unit(s) for cooling. Refrigerant used for cooling must always be subcooled for optimal indoor unit LEV performance; alternate branch devices with no subcooling risk bubbles in liquid supplied to LEV and are not allowed.
    - 2) The BC Controllers shall be specifically used with R410A R2-Series systems. These units shall be equipped with a circuit board that interfaces to the M-NET controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish. The BC Controller shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors, with access and service clearance provided for each controller. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of rated capacity.
    - 3) Each VRF system shall include at least one (1) unused branches or branch devices for future use. Branches shall be fully installed & wired in central location with capped service shutoff valve & service port.
  - b. BC controller cabinet:
    - 1) The casing shall be fabricated of galvanized steel.

- 2) Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves.
    - 3) The unit shall house two tube-in-tube heat exchangers.
  - c. Refrigerant:
    - 1) R410A refrigerant shall be required.
  - d. Refrigerant valves:
    - 1) The unit shall be furnished with multiple branch circuits which can individually accommodate up to 54,000 BTUH and up to three indoor units. Branches may be twinned to allow more than 54,000 BTUH.
    - 2) Each branch shall have multiple two-position valves to control refrigerant flow.
    - 3) Service shut-off valves shall be field-provided/installed for each branch to allow service to any indoor unit without field interruption to overall system operation.
    - 4) Linear electronic expansion valves shall be used to control the variable refrigerant flow.
  - e. Integral drain pan:
    - 1) An integral condensate pan and drain shall be provided.
  - f. Electrical:
    - 1) The BC Controller shall be controlled by integral microprocessors.
    - 2) The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.
- 4. VRF fan coil units - Mitsubishi:
  - a. PEFY-NMAU ceiling-concealed fan coil units:
    - 1) General:
      - a) The PEFY-NMAU fan coil units shall be ceiling concealed ducted indoor fan coil units that mount above the ceiling with a 2-position, field adjustable return and a fixed horizontal discharge and shall have a modulating linear expansion device. The PEFY-NMAU shall be used with the R2-Series outdoor unit and BC Controller. The PEFY-NMAU shall support individual control using M-NET DDC controllers.
    - 2) Indoor unit.
      - a) Unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.
    - 3) Unit cabinet:
      - a) The cabinet shall be ceiling-concealed, ducted.
      - b) The cabinet panel shall have provisions for a field installed filtered outside air intake.
    - 4) Fan:
      - a) Unit shall have external static pressure settings from 0.14 to 0.60 in. WG.

- b) The indoor unit fan shall be an assembly with one or two Sirocco fan(s) direct driven by a single motor.
- c) The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
- d) The indoor unit shall have a ducted air outlet system and ducted return air system.
- e) The indoor fan shall consist of three (3) speeds, high, mid, and low plus the auto-fan function.
- 5) Filter:
  - a) Return air shall be filtered by the optional (to be provided) filter box.
- 6) Coil:
  - a) The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
  - b) The tubing shall have inner grooves for high efficiency heat exchange.
  - c) All tube joints shall be brazed with phos-copper or silver alloy.
  - d) The coils shall be pressure tested at the factory.
  - e) A condensate pan and drain shall be provided under the coil.
  - f) The condensate shall be gravity drained from the fan coil.
  - g) Both refrigerant lines to the PEFY indoor units shall be insulated.
- 7) Electrical:
  - a) The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).
- 8) Controls:
  - a) This unit shall use controls provided by Mitsubishi to perform functions necessary to operate the system.
  - b) Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8 degree F deadband from set point.
- 9) Provide all options and accessories as scheduled on the drawings.
- b. PLFY-NCMU-ER4 ceiling-recessed (4-way) fan coil units:
  - 1) General:
    - a) The PLFY-NCMU-ER4 fan coil units shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.
  - 2) Unit cabinet:
    - a) The cabinet shall be a compact 22-7/16" wide x 22-7/16" deep so it will fit within a standard 24" square suspended ceiling grid.



- b) The cabinet panel shall have provisions for a field installed filtered outside air intake.
- c) Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.
- 3) Fan:
  - a) The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
  - b) The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
  - c) The indoor fan shall consist of three (3) speeds, Low, Mid, and High.
  - d) The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
  - e) The auto air swing vanes shall be capable of automatically swinging up and down for uniform air distribution.
- 4) Filter:
  - a) Return air shall be filtered by means of a long-life washable filter.
- 5) Coil:
  - a) The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
  - b) The tubing have inner grooves for high efficiency heat exchange.
  - c) All tube tube joints shall be brazed with phos-copper or silver alloy.
  - d) The coils shall be pressure tested at the factory.
  - e) A condensate pan and drain shall be provided under the coil.
  - f) The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 19-3/4" inches above the condensate pan.
  - g) Both refrigerant lines to the PLFY indoor units shall be insulated in accordance with the installation manual.
- 6) Electrical:
  - a) The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).
- 7) Controls:
  - a) This unit shall use controls provided by Mitsubishi Electric to perform functions necessary to operate the system.
  - b) Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
  - c) Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.
  - d) Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.
  - e) Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

- 8) Provide all options and accessories as scheduled on the drawings.
- c. PEFY-NMHSU ceiling concealed fan coil units:
  - 1) General:
    - a) The PEFY-NMHSU (Alternate High Static Option) shall be a ceiling concealed ducted indoor fan coil that mounts above the ceiling with a fixed rear return and a horizontal discharge supply, and shall have a modulating linear expansion device. The PEFY-NMHSU shall be used with the R2-Series outdoor unit and BC Controller. The PEFY-NMHSU shall support individual control using M-NET DDC controllers. PEFY-NMHSU models shall feature external static pressure settings up to 1.00 in. WG. Units shall have the ability to control supplemental heat via connector CN24 or CN4F and a 12 VDC output. The unit shall be suitable for use in plenums in accordance with UL 1995 ed 4.
  - 2) Indoor unit:
    - a) The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.
  - 3) Unit Cabinet:
    - a) The cabinet shall be ceiling-concealed, ducted.
    - b) The cabinet panel shall have provisions for a field installed filtered outside air intake.
  - 4) Fan:
    - a) The indoor unit fan shall be an assembly with one or two Sirocco fan(s) direct driven by a single motor.
    - b) The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
    - c) The indoor unit shall have a ducted air outlet system and ducted return air system.
  - 5) Filter:
    - a) Return air shall be filtered by a field-supplied filter.
  - 6) Coil:
    - a) The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
    - b) The tubing shall have inner grooves for high efficiency heat exchange.
    - c) All tube joints shall be brazed with phos-copper or silver alloy.
    - d) The coils shall be pressure tested at the factory.
    - e) A condensate pan and drain shall be provided under the coil.
    - f) The condensate shall be gravity drained from the fan coil.
    - g) Both refrigerant lines to the PEFY indoor units shall be insulated in accordance with the installation manual.
  - 7) Electrical:

- a) The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).
- 8) Controls:
  - a) This unit shall use controls provided by Mitsubishi Electric to perform functions necessary to operate the system.
  - b) Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
  - c) Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.
  - d) Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.
  - e) Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.
- d. PVFY-NAMU-E1 multi-position fan coil units:
  - 1) General:
    - a) The PVFY-NAMU-E1 shall be a multi-position fan coil design with a fixed bottom return, a fixed vertical discharge supply, and a modulating linear expansion device. The unit shall have the capability to be mounted in either the vertical or horizontal (left or right) and have the capability to integrate into systems with various types of indoor units connected. The PVFY-NAMU-E1 shall be used with the R2-Series outdoor unit and BC Controller. The PVFY-NAMU-E1 shall support individual control using M-NET DDC controllers. Units shall have the ability to control supplemental heat or humidifier via a control board connector and a 12 VDC output. Units shall have ability to output fan speed via a relay kit.
    - b) The PVFY-NAMU-E1 shall be suitable for use in air handling spaces in accordance with Section 18.2 of UL 1995 4<sup>th</sup> Edition. The PVFY shall be tested in accordance with ANSI/ASHRAE 193 and have less than 2% air leakage at maximum airflow setting.
  - 2) Indoor unit:
    - a) The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.
  - 3) Unit cabinet:
    - a) The cabinet shall be pre-painted, pre-insulated, 22 gauge galvanized steel.
  - 4) Fan:

- a) The indoor unit fan shall be an assembly with a single direct drive fan with a high efficiency DC motor.
- b) The indoor fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.
- c) The indoor unit shall have a ducted air outlet system and ducted return air system.
- d) The fan shall have 3-speeds with the capability to operate between 0.3-0.8 In.W.G. selectable.
- 5) Filter:
  - a) The unit shall have a 1" filter rack with a reusable filter.
- 6) Coil:
  - a) The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
  - b) The tubing have inner grooves for high efficiency heat exchange.
  - c) All tube joints shall be brazed with phos-copper or silver alloy.
  - d) The coils shall be pressure tested at the factory.
  - e) A condensate pan and drain shall be provided under the coil.
  - f) The condensate shall be gravity drained from the fan coil.
  - g) Both refrigerant lines to the PVFY indoor units shall be insulated in accordance with the installation manual.
- 7) Electrical:
  - a) The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).
- 8) Controls:
  - a) This unit shall use controls provided by Mitsubishi Electric to perform functions necessary to operate the system.
  - b) Control board board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8 degree F deadband from set point.
- 9) Provide all options and accessories as scheduled on the drawings.
- 5. VRF controls - Mitsubishi:
  - a. General:
    - 1) The CITY MULTI Controls Network (CMCN) shall be capable of supporting remote controllers, schedule timers, system controllers, centralized controllers, an integrated web based interface and graphical user workstation.
  - b. Electrical characteristics:
    - 1) General:
      - a) The CMCN shall operate at 30VDC. Controller power and communications shall be via a common non-polar communications bus.
    - 2) Wiring:
      - a) Control wiring shall be installed in a daisy chain configuration from indoor unit to ME remote controller to indoor unit, to the BC controller (main and subs, if applicable) and to the outdoor unit. Control wiring to remote controllers shall be run from the indoor unit terminal block to the controller associated with that unit.

- b) Control wiring for the remote controllers shall be from the remote controller to the first associated indoor unit (TB-5) M-NET connection. The smart ME remote controllers shall be assigned an M-NET address.
    - c) Control wiring for centralized controllers shall be installed in a daisy chain configuration from outdoor unit to outdoor unit, to the system controllers (centralized controllers and/or integrated web based interface), to the power supply.
    - d) The AE-200A, AE-50, and EB-50GU centralized controller shall be capable of being networked with other AE-200A, AE-50 and EB-50GU centralized controllers for centralized control.
  - 3) Wiring type:
    - a) Wiring shall be 2-conductor (16 AWG), twisted shielded pair, stranded wire, as defined by the Design Tool AutoCAD output.
    - b) Network wiring shall be CAT-5 with RJ-45 connection.
- c. CITY MULTI controls network:
  - 1) The CITY MULTI controls network (CMCN) consists of remote controllers, centralized controllers, and/or integrated web based interface communicating over a high-speed communication bus. The CMCN shall support operation monitoring, scheduling, occupancy, and online maintenance support.
- d. CMCN remote controllers:
  - 1) Smart ME remote controller (PAR-U01MEDU):
  - 2) The Smart ME remote controller (PAR-U01MEDU) shall be capable of controlling up to 16 indoor units (defined as 1 group). The Smart ME remote controller shall control the following grouped operations: On/Off, Operation Mode (cool, heat, auto, dry, fan and setback, temperature set point, fan speed setting, and airflow direction setting). The Smart ME remote controller shall support timer settings of on/off/temperature up to 8 times in a day in 5-minute increments. The Smart ME remote controller shall support an Auto Off timer. The Smart ME remote controller shall be able to limit the set temperature range from the Smart ME remote controller, or via a PC through a licensed AE-200A. The temperature range can be set from a touch screen panel on the AE-200A. The room temperature shall be sensed at either the Smart ME remote controller or the indoor unit dependent on the indoor unit dipswitch setting. The Smart ME remote controller shall display a four-digit error code in the event of system abnormality or error. The ME remote controller shall incorporate manual addressing using rotary dial switch to the M-NET communication bus. The ME remote controller shall connect using two-wire, stranded, non-polar control wire to the indoor unit.
- e. Input/Output (IO) boards:
  - 1) Advanced HVAC controller (AHC):
    - a) The AHC shall be capable of providing programmable binary and analog inputs and outputs to control general equipment in conjunction with indoor unit functions and states. Input and output states and values shall be monitored through the AE-200A or the Smart ME Remote controller. The Smart ME remote

controller shall be able to adjust temperature and humidity set points for equipment controlled by the AHC. In addition to analog and binary inputs the AHC shall monitor M-NET equipment states and sensor values. Available inputs include room temperature, room humidity, occupancy, brightness, outdoor temperature, inlet/outlet water temperature (PWFY), on/off state, mode, ventilation on/off, error status. In addition to programmable analog and binary outputs, the AHC shall be capable of control of indoor unit on/off, mode, temperature set point, fan speed, heat recovery unit on/off and heat recovery unit fan speed.

- 2) Digital Input Digital Output (DIDO) board:
  - a) The DIDO board shall be capable of providing On/Off control for non-Mitsubishi Electric equipment via the AE-200A Centralized Controller's licensed web browser functions, the interlock function of the AE-200A and the TG-2000A software. Each DIDO board shall have two digital inputs and two digital outputs. Each digital output shall be capable of supporting an independent schedule via the AE-200A Centralized Controller's web browser functions and the TG-2000A software. Status indication of the On/Off state of the non-Mitsubishi Electric equipment shall be either via the On/Off status of the digital output or by receipt of a digital input to the DIDO board.
  - b) The DIDO board shall be capable of receiving a digital input for interlock settings with the CITY MULTI indoor units or digital outputs on the DIDO board. Based on the digital input status the DIDO board shall be capable of setting the following parameter on the indoor unit On/Off, Mode, and Set Temperature to predefined settings. The DIDO board shall also be capable of interlocking the On/Off state of a digital output on the DIDO board based on an onboard channel digital input status or a free contact input status from system indoor units.
- 3) Analog Input (AI) board:
  - a) The AI board shall be capable of monitoring temperature or humidity via the AE-200A Centralized Controller's web browser functions and the TG-2000A software. Each AI board shall have two analog inputs. Each input shall be capable of receiving a 4/20mA, 0/10 VDC, or 1/5 VDC signal for monitoring temperature or humidity. The AI board shall be capable of monitoring the temperature or humidity input and shall be capable of displaying graphical trending of the temperature or humidity values via the AE-200A Centralized Controller's web browser functions and the TG-2000A software. Notification of user adjustable high and low level alarms shall be capable of being emailed to distribution list or outputted via a digital output.
  - b) The AI board shall be capable of setting the following parameters on the indoor unit On/Off, Mode, and Set Temperature to predefined settings based on the input value of the temperature or humidity. The AI board shall also be capable of interlocking the

- On/Off state of a digital output on the input value of the temperature or humidity.
- f. Centralized controller (Web-enabled):
    - 1) AE-200A centralized controller:
      - a) The AE-200A centralized controller shall be capable of controlling a maximum of 50 indoor units across multiple outdoor units. The AE-200A centralized controller shall be powered from the external power supply (PAC-SC51KUA). The AE-200A centralized controller shall support system configuration, daily/weekly scheduling, monitoring of operation status, night setback settings, free contact interlock configuration and malfunction monitoring. The AE-200A centralized controller shall have five basic operation controls which can be applied to an individual indoor unit, a group of indoor units (up to 50 indoor units), or all indoor units (collective batch operation). This basic set of operation controls for the AE-200A centralized controller shall include on/off, operation mode selection (cool, heat, auto (R2/WR2-Series only), dry, setback (R2/WR2-Series only) and fan), temperature setting, fan speed setting, and airflow direction setting. Since the AE-200A provides centralized control it shall be able to enable or disable operation of local remote controllers. In terms of scheduling, the AE-200A centralized controller shall allow the user to define both daily and weekly schedules with operations consisting of ON/OFF, mode selection, temperature setting, air flow (vane) direction, fan speed, and permit/prohibit of remote controllers.
      - b) All AE-200A centralized controllers shall be equipped with one RJ-45 Ethernet port to support interconnection with a network PC via a closed/direct Local Area Network (LAN). The AE-200A Centralized Controller shall be capable of performing initial settings via a PC using the AE-200A centralized controller's initial setting browser.
      - c) Standard software functions shall be available so that the building manager can securely log into each AE-200 A via the PC's web browser to support operation monitoring, scheduling, error email, interlocking and online maintenance diagnostics. Standard software functions shall not expire.
  - g. Graphical user workstation software:
    - 1) The Graphical The Graphical user workstation software (TG-2000A) shall require a field supplied PC.
    - 2) TG-2000A software:
      - a) The TG-2000A integrated system software shall enable the user to control multiple AE-200A. The TG-2000A configured computer shall be capable of controlling up to forty AE-200A centralized controllers with a maximum of 2,000 indoor units across multiple outdoor units. The TG-2000A software shall be required to simultaneously control more than 1 AE-200/AE-50/AE-200A centralized controllers from a single PC using a single software session. Licensing per function, per AE-200A

centralized controller shall be required for the TG-2000A software.

- B. Exhaust fans:
1. Exhaust fans are to be Greenheck Series G-VG or equal direct drive, roof-curb mounted, centrifugal roof exhausters.
  2. Fans shall have non-overloading, backwardly inclined, centrifugal wheels, birdscreens, direct drive EC motor and drive assembly, aluminum housing, backdraft damper, and disconnect switch, all completely weatherproofed for outdoor installation.
  3. Provide all options and accessories as scheduled on the drawings.
- C. Kitchen exhaust fan:
1. Greenheck series CUBE or equal belt drive upblast, roof-curb mounted, centrifugal roof exhausters.
  2. Fans shall have non-overloading, backwardly inclined, centrifugal wheels, birdscreens, v-belt drive motor with adjustable sheaves, aluminum housing, backdraft damper, and disconnect switch, all completely weatherproofed for outdoor installation.
  3. Verify that the air delivery capabilities, fan wheel size, motor horsepower and fan RPM meet those of the Greenheck fans scheduled.
  4. Provide all options and accessories as scheduled on the drawings.
- D. Upblast exhaust fan:
1. Upblast exhaust fans are to be Greenheck series CUBE or equal upblast exhaust fan. Verify that the air delivery capabilities, fan wheel size, and motor horsepower meet or exceed those listed for the Greenheck fans scheduled.
  2. Fan shall have nonoverloading, backwardly inclined, centrifugal wheel, birdscreen, belt drive premium efficiency motor, aluminum housing, back-draft damper, and disconnect switch, all completely weatherproofed for outdoor installation.
  3. Provide all options and accessories as scheduled on the drawings.
- E. Gravity hoods:
1. Greenheck Fabrahood, or equal gravity roof hoods.
  2. Precision formed, arched panels with interlocking seams. Curb cap to be 8" larger than throat size. 1/2" galvanized steel mesh mounted horizontally across the intake/discharge area of the hood. Galvanized steel support members fasten so that hood can either be completely removed from the base or hinged open.
  3. Provide all options and accessories as scheduled on the drawings.
- F. Split air conditioning units:
1. The split air conditioning system is to be a ductless split cooling only air conditioning system with both indoor fan coil unit and outdoor condensing unit from the same manufacturer.
  2. The indoor fan coil unit is to be a Mitsubishi type Mitsubishi PCA or equal ceiling suspended unit. The outdoor condensing unit is to be a Mitsubishi type PUY or equal unit.
  3. Cooling capacity is to be equal to or greater than the cooling capacity scheduled on the drawings.



4. Provide all options and accessories as scheduled on the drawings.

G. Filters:

1. Filters for each type of equipment shall be as follows:
  - a. Variable refrigerant flow fan coil units - concealed units: Concealed fan coil unit filter boxes are shipped from the factory with 2" MERV-13 filters. These filters are to be used for start-up purposes. After start-up work is complete and prior to the start of air balance work, replace all filters with 2" Camfil FARR ap-eleven or equal MERV-11 pleated media type filters.
  - b. Variable refrigerant flow fan coil units - multi-position units: Multi-position fan coil units are shipped from the factory with 1" washable filters. These filters are to be used for start-up purposes. After start-up is complete and prior to the start of air balance work, replace all filters with 1" Camfil FARR ap-eleven or equal MERV-11 pleated media type filters.
2. The filter housing of each concealed variable refrigerant fan coil unit are to have filter enclosures that positively prevent air by-pass of the filters.

H. [Addendum 4] Duct silencers:

1. General:
  - a. Duct silencers shall be Vibro-Acoustics models RD-MV and SRD-ULV and shall be of the size, configuration and capacity as scheduled on the drawings.
  - b. Silencer inlet and outlet connection dimensions must be equal to the duct sizes shown on the drawings. Duct transitions at silencers are not permitted unless shown on the drawings.
  - c. Silencers shall be constructed in accordance with ASHRAE and SMACNA standards for the pressure and velocity classification specified for the air distribution system in which it is installed. Material gauges noted in this section or on the drawings are minimums. Material gauges shall be increased as required for the system pressure and velocity classification. The silencers shall not fail structurally when subjected to a differential air pressure of 8 inches water gauge.
  - d. 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.
  - e. All perforated steel shall be adequately stiffened to ensure flatness and form. All spot welds shall be painted.
  - f. Fire-Performance Characteristics: Silencer assemblies, including acoustic media fill, Vibar™ film liner, sealants, and acoustical spacer, shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E84, NFPA 255 or UL 723.
  - g. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2007.
  - h. Media shall be of acoustic quality, shot-free glass fiber insulation with long, resilient fibers bonded with a thermosetting resin. Glass fiber density and compression shall be as required to ensure conformance with laboratory test data. Glass fiber shall be packed with a minimum of 15%

compression during silencer assembly. Media shall be resilient such that it will not crumble or break, and conform to irregular surfaces. Media shall not cause or accelerate corrosion of aluminum or steel. Mineral wool will not be permitted as a substitute for glass fiber.

2. **Testing:**
  - a. The manufacturer shall test the silencer(s) as indicated in the silencer schedule. The engineer shall be notified of the test date at least two weeks in advance and the test may be witnessed by the engineer. Test shall show compliance with the project criteria and is subject to engineer approval.
  - b. Test facilities and test reports shall be open to inspection upon request from the Engineer. Silencer performance must have been substantiated by laboratory testing according to ASTM E-477-06a and so certified when submitted for approval. The aero-acoustic laboratory must be NVLAP accredited for the ASTM E-477-06a 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.
3. **Provide all options and accessories as scheduled on the drawings.**

## 2.3 SYSTEMS

- A. Air distribution duct systems:
  1. Supply, return, exhaust, transfer and outside air intake duct and fittings, not including grease exhaust ducts:
    - a. 2.500 fpm, +2.0"SP to -2.0"SP for supply, return, exhaust, transfer and outside air intake ducts.
    - b. General: Ductwork shall be round spiral lock seam or rectangular galvanized steel construction.
    - c. Duct Construction:
      - 1) General: Construction shall be in accordance with the latest ASHRAE Standards, SMACNA 1995 - Second Edition with Addendum No. 1 November 1997 HVAC Duct Construction Standards, and the 2013 California Mechanical Code.
      - 2) All duct joints and seams are to be constructed to meet the requirements of the 1995 SMACNA HVAC Duct Construction Standards noted above. Manufactured joints, such as Ductmate or TDC, are to be installed in strict accordance with the manufacturer's installation requirements.
      - 3) Care shall be taken to ensure that all duct reinforcing requirements are met.
      - 4) All 90° branch fittings for round ducts are to be of the conical tee type, conical saddle tap, or as detailed on the drawings.
      - 5) All spiral duct and fittings inside building to be United McGill, Uni-Seal, or equal.
      - 6) Spiral duct joints for diameters up to 36" round are to be fabricated using sleeve type couplings.
      - 7) Commercial gauge adjustable elbows may be used in concealed areas for duct sizes up through 14" diameter. For duct sizes greater than 14" diameter and where duct is exposed, elbows shall be United McGill "Uni-Seal" gored elbows or equal.

- 8) All spiral round duct shall be installed in strict accordance with the manufacturer's requirements.
- 9) All rectangular duct, fittings and plenums are to be constructed in accordance with 1995 SMACNA, HVAC Duct Construction Standards noted above.
- 10) Provide galvanized steel angle ring, 2" wide at all locations where exposed ducts penetrate walls. Angle rings are to be installed to present a finished and aesthetically pleasing appearance.
- 11) All exposed duct, fittings, sealants and apparatus are to be installed suitable for painting.
- 12) All elbows and bends are to be made with the minimum inside radius equal to 1.5 times the duct diameter or centerline radius ( $R/W=1.5$ ), where possible. If field conditions do not allow 1.5 inside radius, provide elbow and bend radius as long as possible. Elbow and bend radius shall be no less than that shown on the drawings. All conditions with less than 1.5 inside radius must be approved by the Architect, prior to fabrication and/or installation.
- 13) Non-radius, square heel and throat rectangular elbows, with or without turning vanes, are not acceptable unless specifically shown on the drawings.
- 14) All radius elbows in rectangular ductwork are to include one (1) splitter vane, located at a distance of 1/3 of the duct width as measured in from the elbow throat.
- d. Ducts are to be sealed so as to conform to SMACNA Duct Seal Class C. Duct tape as a sealant is not acceptable. A brush applied, high pressure duct sealant is to be utilized, MEI or equal. Sealant is to be verified that it is suitable for painting. Sealant is to be applied in a neat manner in exposed duct locations. Duct sealant is to be applied in complete accordance with the manufacturer's application instructions.
- e. Flexible Duct – Thermaflex M-KE, R6.0, reinforced metalized polyester vapor barrier, acoustically rated inner core; or equal pre-insulated flexible duct may be used for final connection between ducts, grilles, and diffusers where shown on the drawings. Maximum length of flexible duct to be six (6) feet. Duct is to be carefully supported to provide smooth air flow path and to prevent sagging. Flexible duct must meet UL 181, Class 1, factory made, air duct requirements, California State Fire Marshall Approved. Install in strict accordance with manufacturer's installation instructions. Duct insulation is to be a minimum of 1-1/2" thick, 3/4 pounds per cubic foot density. Flexible duct is to have mounting collars. Joints of flexible ducts with other ducts or registers are to be made with sheet metal screws.
- f. All roof-mounted duct and/or ducts exposed to weather are to be constructed using roll-formed flanges with corner angles, gasket and cleats. Ductmate, TDC, TDF, or equal.
2. Grease exhaust duct systems:
  - a. 2,500 fpm, +2.0"SP to -2.0"SP for grease exhaust duct.
  - b. Duct Construction:
    - 1) Construction shall be in accordance with the latest ASHRAE Standards, SMACNA 1995 Second Edition HVAC Duct Construction Standards with 1997 Addendum 1, and the 2016 California Mechanical Code.

- 2) Grease exhaust ducts are to be constructed entirely of 16 gauge carbon steel using continuous external welded joints.
    - 3) All elbows and bends are to be made with the minimum inside radius equal to 1.5 times the duct diameter or centerline radius ( $R/W=1.5$ ), where possible. If field conditions do not allow 1.5 inside radius, provide elbow and bend radius as long as possible. Elbow and bend radius shall be no less than that shown on the drawings. All conditions with less than 1.5 inside radius must be approved by the Architect, prior to fabrication and/or installation.
  - c. Grease exhaust duct shall be completely covered with 3M Fire Barrier Duct Wrap 20A or equal. Fire Barrier Duct Wrap is two (2) inches thick and is installed in two layers with the manufacturer's required overlap at joints on each layer. The Fire Barrier Duct Wrap is to be installed in complete accordance with the manufacturer's installation instructions. The Fire Barrier Duct Wrap shall be listed to pass the Internal Grease Duct Fire Test, ICBO AC101.
3. General:
  - a. Access doors - non grease exhaust duct: Doors in sheet metal ducts and plenums for access to dampers, extractors and equipment shall be No. 18 gauge, and made airtight by means of felt strips. Doors shall be sized as required for reasonable service access. Minimum size shall be 12" x 12" unless limited by duct size.
    - 1) Fabricate in accordance with SMACNA Duct Construction Standards and as indicated.
    - 2) Review locations prior to fabrications.
    - 3) Fabricate rigid and close-fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum 1 inch thick insulation with metal cover.
    - 4) Access doors smaller than 12 inches square may be secured with sash locks.
    - 5) Provide 2 hinges and 2 sash locks for sizes up to 18 inches square, 3 hinges and 2 compression latches with outside and inside handles for sizes up to 24 x 18 inches.
    - 6) Access doors with sheet metal screw fasteners are not acceptable.
  - b. Duct access doors - grease exhaust duct: Access doors in grease exhaust ducts are to be 3M Fire Barrier Grease Duct Access Doors or equal. Grease duct access doors are to be UL rated. Provide 3M Fire Barrier Grease Duct, Duct Access Door Hardware Kit for all access doors located in the building with fire barrier duct wrap. Install access doors in grease exhaust ducts in strict accordance with the manufacturer's installation instructions.
  - c. Balancing dampers: Shall be furnished and installed where required to completely balance and otherwise adjust the air quantities to each supply and return outlet, branch duct and exhaust grille. Manual balance dampers shall be provided in each branch duct. Balancing dampers shall not be installed in the collar of any flexible duct.
    - 1) Balancing dampers in rectangular ducts:
      - a) Ruskin Model CD50 or equal low leakage damper with airfoil type extruded aluminum blade with a maximum depth of 6" and with an integral structural reinforcing tube running full length of

each blade. Blade edge seals shall be extruded vinyl double edge design with inflatable pocket. Linkage shall be concealed in frame damper manufacturer's literature shall include performance data developed from testing in accordance with AMCA Standard 500 in an AMCA approved laboratory showing pressure drop for all sizes of dampers required at all anticipated airflow rates.

- 2) Balancing dampers in round ducts:
  - a) Fabricate in accordance with SMACNA Duct Construction Standards and as indicated.
  - b) Shall be furnished and installed where required to completely balance and otherwise adjust the air quantities to all supply and return outlets, branch ducts, and exhaust grilles. Manual balance dampers shall be provided in each branch duct. Damper to be one gauge heavier than the duct gauge. Provide Jiffy Bearings JB-1 damper hardware or equal.
  - c) Except in round ductwork 12 inch and smaller, provide end bearings. On multiple blade dampers, provide oil impregnated nylon or sintered bronze bearings.
  - d) On insulated ducts, mount quadrant regulators on stand-off mounting brackets, bases or adaptors.

- d. Painting: Paint the inside of all backs of diffusers, registers, grilles, ducts and dampers extending as far as visible with flat black paint.
- e. Flexible connections for supply, return air, exhaust and outside air duct connections to the fan coil units, exhaust fans, indirect evaporative cooling units and indirect/direct evaporative cooling units, and at all seismic building joints shall be 16 oz. airtight "Ventglass" or equal non-combustible fabric with fire retardant neoprene coating on outside. Attach to ductwork by lock seam. Install 6" long. Provide sheet metal rain cover over flexible connections exposed to the weather.
- f. Ducts exposed to the weather are to be completely weatherproofed. All joints and seams are to be sealed using Hardcast Galva-Grip or equal weatherproof duct sealant. The manufacturer's installation instructions are to be followed closely.
- g. Duct test holes: Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Refrigerant piping

1. Refrigerant piping is to be ASTM B2800, Type "ACR" hard-drawn copper.
2. Joints are to be brazed using Silfos-5 or equivalent brazing material.

C. Supports and anchors

1. Pipe hangers and supports:
  - a. Hangers for pipe sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
  - b. Hangers for pipe sizes 2 to 4 inch, and cold pipe sizes 6 inch and over: Carbon steel, adjustable, clevis.
  - c. Multiple or trapeze hangers: Steel channels with welded spacers and hanger rods.

- d. Wall support for pipe sizes to 3 inch: Cast iron hook.
- e. Wall support for pipe sizes 4 inch and over: Welded steel bracket and wrought steel clamp.
- f. Vertical support: Steel riser clamp.
- g. Roof support for pipe sizes to 4 inch, and all cold pipe sizes: Cast iron adjustable pipe saddle, locknut nipple, and steel support.
- h. Copper pipe support: Carbon steel ring, adjustable, copper plated.
- i. Shield for insulated piping 2 inch and smaller: 18 gauge galvanized steel shield over insulation in 180 degree segments, minimum 12 inch long at pipe support.
- j. Shield for insulated piping 2-1/2 inch and larger (except cold water piping): Pipe covering protective saddles.
- k. Shields for insulated cold water piping 2-1/2 inch and larger: Hard block nonconducting saddles in 90 degree segments, 12 inch minimum length, block thickness same as insulation thickness.
- 2. Hanger rods: Steel, threaded both ends, threaded one end, or
- 3. continuous threaded.
- 4. Flashing:
  - a. Follow the roof manufacturer's recommendations for all roof penetrations, curbs, platforms, and sleepers.
- 5. Sleeves:
  - a. Sleeves for pipes through nonfire rated floors: Form with 18 gauge galvanized steel.
  - b. Sleeves for pipes through nonfire rated beams, walls, footings, and potentially wet floors: Form with steel pipe or 18 gauge, 1.2 mm thick galvanized steel.
  - c. Sleeves for pipes through fire rated and fire resistive floors and walls, and fireproofing: Prefabricated fire rated sleeves, including seals, UL Listed.
  - d. Sleeves for round ductwork: Form with galvanized steel.
  - e. Sleeves for rectangular ductwork: Form with galvanized steel or wood.
  - f. Stuffing fire stopping insulation: Glass fiber type, noncombustible.
  - g. Caulk: Acrylic sealant.
- D. Mechanical systems and equipment insulation
  - 1. Ductwork:
    - a. General:
      - 1) Adhesives and insulation materials: Composite fire and smoke hazard ratings maximum 25 for Flame Spread and 50 for Smoke Developed. Adhesives to be waterproof.
      - 2) Anti-microbial agent surface coating: EPA-registered biocide, ASTM C-1338, ASTM G-21, ASTM G-22.
    - b. Insulation shall be provided on all ductwork where shown on the drawings, and all concealed supply, return and outside air intake ductwork.
    - c. Concealed ductwork: Cover all sides with 1-1/2 inch thick, 3/4 pounds per cubic foot density duct wrap with foil scrimkraft or equal, applied per the manufacturer's application specification. Note that foil scrimkraft is not required to be sealed as a vapor barrier. Johns Manville Microlite XG formaldehyde-free Type 75 FSK, Certainteed SoftTouch Type 75 FSK, or equal.

- d. 2" Duct liner: Ducts shown on the drawings to be internally lined with 2" liner, shall be lined in the interior with 2 inch thick fiberglass duct liner; NRC=1.00 acoustical performance (Type "A" mounting) with a minimum R-value of 8.0. Duct liner shall be installed in complete accordance with the manufacturer's installation instructions. Ducts shall be increased in size to accommodate lining without loss of area. Lined ducts need not be covered. Duct liner to be Johns Manville Permacote Linacoustic Standard, Certainteed Type 150 ToughGard R with Enhanced Surface, or equal.
  - e. 1" Duct liner: Ducts shown on the drawings to be internally lined with 1" liner are to be lined in the interior with 1 inch thick, 1.5 pounds per cubic foot duct liner with a minimum R-value of 4.2. Duct liner shall be installed in complete accordance with the manufacturer's installation instructions. Ducts shall be increased in size to accommodate lining without loss of area. Lined ducts need not be covered. Duct liner to be Johns Manville Permacote Linacoustic Standard, Certainteed Type 150 ToughGard R with Enhanced Surface, or equal.
2. Piping and equipment:
- a. General: Adhesives and insulation materials: Composite fire and smoke hazard ratings of maximum 25 for Flame Spread and 50 for Smoke Developed. Adhesives to be waterproof.
  - b. Refrigerant piping:
    - 1) General: Insulation shall be provided on all suction refrigerant piping on cooling only systems and all gas and liquid piping is to be insulated on variable refrigerant flow (VRF) systems.
    - 2) Insulation: Refrigerant piping insulation shall be Armacell AP Armaflex SS or equal 1" wall thickness, elastomeric, closed cell pipe insulation with longitudinal slit and self-sealing adhesive on each side of slit.
    - 3) Refrigerant piping insulation located outdoors is to be sealed with a weatherproof sealant in accordance with the insulation manufacturer's installation instructions. The sealant is to be Armaflex WE finish or equal.
  - c. Jackets:
    - 1) Indoor refrigerant piping:
      - a) Refrigerant piping insulation installed indoors shall have PVC jacketing on all elbows.
    - 2) Outdoor refrigerant piping:
      - a) Piping: Apply aluminum metal jacket 0.016 inch with moisture barrier around pipe and slip edge into preformed Z lock position to shed water. Butt next jacket section leaving approximately 3/8 inch gap. Place preformed 2 inch butt strap with sealant over the seam and secure with 1/2 aluminum band and wing seal.
      - b) Fittings: Apply prefabricated metal fittings identical in composition to pipe jacketing.
- E. Vibration isolation
- 1. Refer to the drawings for vibration isolation requirements.
  - 2. Vibration isolation is to be Mason Industries or equal.

F. Mechanical identification

1. Piping identification shall be manufactured by Marking Services, Incorporated or equal.
2. Materials:
  - a. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.
  - b. Plastic equipment nameplates - on equipment: Laminated 3-layer plastic with engraved black 2 inch letters on light contrasting background color. Required for each fan coil unit, boiler, pump, variable frequency drive, expansion tank, air separator, etc.
  - c. Plastic equipment nameplates - on tee of t-bar ceiling: Laminated 3-layer plastic with engraved black 1/2" high letters on white background. Each plastic nameplate is to be approximately 3/4" high to fit on the tee of the t-bar ceiling at each fan coil unit above a t-bar ceiling. Each plastic nameplate is to be securely and permanently affixed to the tee of the t-bar ceiling below each fan coil unit as close as possible to the filter access location. The intent of the plastic nameplates is to allow District service personnel accurate information from below the ceiling on which ceiling tile to remove for access to service any fan coil unit.
  - d. Metal tags: Brass aluminum with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
  - e. Plastic pipe markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fly around pipe or pipe covering; minimum information to indicate flow direction and fluid being conveyed.

G. Testing, adjusting, and balancing

1. Scope includes, but is not limited to:
  - a. Testing, adjustment, and balancing of air systems.
  - b. Measurement of final operating condition of HVAC systems.
2. References:
  - a. AABC: National standards for field measurement and instrumentation, total system balance.
  - b. ASHRAE: Systems handbook: Testing, adjusting, and balancing.
  - c. NEBB: Procedural standards for testing, balancing, and adjusting of environmental systems.
3. Submittals:
  - a. Submit name of adjusting and balancing agency for approval.
  - b. Pre-construction plan
    - 1) The testing, adjusting and balancing Contractor is to submit a plan at least two (2) weeks prior to the commencement of testing, adjusting and balancing work which includes the following:
      - a) A complete set of report forms intended for use on the project, with all data filled in except for the field readings. Forms to be project specific.
      - b) Marked up shop drawings identifying all HVAC equipment to be balanced, and associated outlets and terminal devices.
      - c) Identification of the type, manufacturer, and model of actual instruments to be used, and clear indication of which instrument will be used to take each type of reading. Calibration certs to be included.



- d) A narrative of any project specific and/or non-standard testing, adjusting and balancing procedures to be used, and the equipment or systems they apply to.
  - c. A preliminary testing, adjusting and balancing report is to be submitted at the completion of testing, adjusting and balancing work for technical review by the commissioning authority prior to the start of functional testing.
  - d. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets and indicating thermostat locations.
- 4. Report forms:
  - a. Submit reports on AABC National Standards for Total System Balance or NEBB forms.
  - b. Forms shall include the following information:
    - 1) Title page:
      - a) Company name
      - b) Company address
      - c) Company telephone number
      - d) Project name
      - e) Project location
      - f) Project Architect
      - g) Project Architect
      - h) Project Contractor
      - i) Project altitude
    - 2) Instrument list:
      - a) Manufacturer
      - b) Model number
      - c) Instrument
      - d) Serial number
      - e) Range
      - f) Calibration date
    - 3) VRF fan coil unit (ceiling-concealed and multi-position) data:
      - a) Manufacturer
      - b) Model number
      - c) Identification/number
      - d) Design supply air quantity
      - e) Actual supply air quantity
      - f) Design return air quantity
      - g) Actual return air quantity
      - h) Design outside air quantity
      - i) Actual outside air quantity
      - j) Design static pressure
      - k) Actual static pressure
      - l) Actual discharge pressure
    - 4) VRF fan coil unit (ceiling-concealed and multi-position) cooling data:
      - a) Identification/number
      - b) Location
      - c) Service
      - d) Manufacturer

- e) Air flow, design and actual
- f) Entering air DB temperature, design and actual
- g) Entering air WB temperature, design and actual
- h) Leaving air DB temperature, design and actual
- i) Leaving air WB temperature, design and actual
- j) Air pressure drop, design and actual
- 5) VRF fan coil unit (ceiling-concealed and multi-position) heating data:
  - a) Identification/number
  - b) Location
  - c) Service
  - d) Manufacturer
  - e) Air flow, design and actual
  - f) Entering temperature, design and actual
  - g) Leaving air temperature, design and actual
  - h) Air pressure drop, design and actual
- 6) Exhaust fan data:
  - a) Location
  - b) Manufacturer
  - c) Model
  - d) Air flow, design and actual
  - e) Total external static pressure, design and actual
  - f) Actual inlet pressure
  - g) Actual discharge pressure
  - h) Fan RPM.
- 7) Upblast exhaust fan data:
  - a) Location
  - b) Manufacturer
  - c) Model
  - d) Air flow, design and actual
  - e) Total external static pressure, design and actual
  - f) Actual inlet pressure
  - g) Actual discharge pressure
  - h) Fan RPM
- 8) Kitchen exhaust fan data:
  - a) Location
  - b) Manufacturer
  - c) Model
  - d) Air flow, design and actual
  - e) Total external static pressure, design and actual
  - f) Actual pressure
  - g) Actual discharge pressure
  - h) Fan RPM
- 9) Electric motors data:
  - a) Manufacturer
  - b) HP/BHP
  - c) Phase, voltage, amperage; nameplate, actual, no load.
  - d) RPM
  - e) Service factor
  - f) Starter size, rating, heater elements

- 10) V-belt drive:
  - a) Identification/location
  - b) Required driven RPM
  - c) Driven sheave, diameter and RPM
  - d) Belt, size, and quantity
  - e) Motor sheave, diameter, and RPM
  - f) Center to center distance, maximum, minimum, and actual
5. Air/water balance tolerances:
  - a. Air balance shall be made with least possible friction.
  - b. Allowances shall be made for air filter resistance at the time of the tests. The main air supplies shall be at design air quantity with pressure drop across the air filter bank at simulated dirty condition.
  - c. Air balance tolerances:
    - 1) Supply air: The room air supply shall be plus 10%, minus 0% from the design air quantity for rooms with an air supply of under 1000 cfm and plus or minus 5% where the air supply is 1000 cfm or more. In rooms with multiple supply outlets, the air supplied shall be within plus 5%, minus 0% of the design air quantity.
    - 2) Return air: The main air returns shall be plus 10%, minus 0% from the design air quantity for rooms with an air return of under 1000 cfm and plus or minus 5% where the air return is 1000 cfm or more. In rooms with multiple return inlets, the air returned shall be within plus 5%, minus 0% of the design air quantity.
    - 3) Outside air: The outside air setting is to be plus 5%, minus 5% from the design air quantity.
    - 4) Exhaust air: The exhaust air quantity is to be plus 5%, minus 5% from the design air quantity.
6. Project record documents:
  - a. Comply with Division 1 requirements.
  - b. Accurately record actual locations of flow measuring stations and balancing valves and rough setting.
7. Quality assurance:
  - a. Agency shall be company specializing in the adjusting and balancing of systems specified with a minimum of 3 years experience. Perform work under supervision of AABC Certified Test and Balance Architect or NEBB Certified Testing, Balancing, and Adjusting Supervisor.
  - b. Total system balance shall be performed in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance, ASHRAE Systems Handbook, or NEBB Procedural Standards for Testing, Balancing, and Adjusting of Environmental Systems.
8. Schedule and sequence work to ensure completion of work before substantial completion of project.
9. Agencies: The following agencies are acceptable for this Project:
10. National Air Balance Co., Mechanical Environmental Systems Analysis and Adjustment Agency (MESA<sup>3</sup>), or equal.
11. Examination:
  - a. Before commencing work, verify that systems are complete and operable. Ensure the following:
    - 1) Equipment is operable and in a safe and normal condition.

- 2) Temperature control systems are installed complete and operable.
    - 3) Proper thermal overload protection is in place for electrical equipment.
    - 4) Filters are clean and in place. If required, install temporary media in addition to final filters.
    - 5) Duct systems are clean of debris.
    - 6) Correct fan rotation.
    - 7) Fire/smoke dampers, modulating dampers and volume dampers are in place and open.
    - 8) Coil fins have been cleaned and combed.
    - 9) Access doors are closed and duct end caps are in place.
    - 10) Air outlets are installed and connected.
    - 11) Duct system leakage has been minimized.
    - 12) Hydronic systems have been flushed, filled, and vented.
    - 13) Correct pump rotation.
    - 14) Proper strainer baskets are clean and in place.
    - 15) Service and balance valves are open.
  - b. Report any defects or deficiencies noted during performance of service to the Architect.
  - c. Promptly report abnormal conditions in mechanical systems or conditions which prevent system balance.
  - d. If, for design reasons, system cannot be properly balanced, report to Architect as soon as observed.
  - e. Beginning of work means acceptance of existing conditions.
12. Preparation:
- a. Provide instruments required for testing, adjusting, and balancing operations.
  - b. Provide additional balancing devices as required.
13. Adjusting:
- a. Recorded data shall represent actually measured or observed condition.
  - b. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
  - c. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
  - d. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
  - e. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by Owner's Representative.
14. Air system procedure:
- a. Adjust air handling and distribution systems to provide required or design supply, return, outside and exhaust air quantities at all locations.
  - b. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
  - c. Measure air quantities at air inlets and outlets.
  - d. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
  - e. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

- f. Vary total system air quantities by adjustment of fan speeds. If drive changes are required, air balance Contractor is to submit the required drive changes including sheave and belt sizes needed. If the Owner decides to make the drive changes proposed, the Contractor will be requested to submit a proposal for the work. If the Owner decides not to make the drive changes proposed, the Contractor is to complete the air balance work using the drives installed. Vary branch air quantities by damper regulation.
- g. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- h. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- i. Adjust automatic dampers for outside, return air, and exhaust air for design conditions.
- j. Measure temperature conditions across outside air, return, and exhaust dampers to check leakage.

### PART 3 - EXECUTION

#### 3.1 GENERAL

- A. For the actual fabrication, installation, and testing of work under this Section, use only thoroughly trained and experienced workmen who are properly qualified for the work they perform. All installers are to be completely familiar with the manufacturer's current recommended methods of installation and shall so execute.

#### 3.2 EQUIPMENT

- A. All equipment is to be installed to meet the manufacturer's installation instructions, guidelines, and recommendations.

#### 3.3 SPECIAL REQUIREMENTS

- A. During construction meet or exceed all requirements of ASHRAE standard 62.1-2016 Chapter 7, Construction and System Start-up.
- B. Provide temporary construction ventilation. Continuously ventilate during installation of materials that emit volatile organic compounds (VOC) and after installation until emissions dissipate including, but not limited to, applications of adhesives, paints, floor coatings, stains and varnishes. Exhaust areas to outside the buildings; do not transfer air to other enclosed spaces. If continuous ventilation is not possible using the building's HVAC system, then ventilate using operable windows and temporary fans that have the capacity to provide a minimum of three (3) air changes per hour in the area requiring ventilation.
- C. All fans in the HVAC system are to be turned off and all supply and return openings are to be sealed from dust and debris infiltration during dust producing activities such as drywall installation, sanding, sweeping or blowing, carpet installation, etc.

- D. Allow products that have odors and significant VOC emissions to off-gas in dry, well-ventilated space for a sufficient period to dissipate odors and emissions prior to delivery to the construction site. Condition products without containers and packaging to maximize off-gassing of VOCs. Condition products in a ventilated warehouse or other building.
- E. Where odorous and/or high VOC-emitting products are applied on-site, apply them prior to installation of porous and fibrous materials including foams.
- F. Vacuum carpeted and other accessible surfaces (use a certified vacuum or HEPA vacuum that meets or exceeds the CRI Seal of Approval/Green Label Vacuum Cleaner Program criteria for vacuum cleaning performance) after construction is complete and prior to occupancy.
- G. Oil film on sheet metal shall be removed before shipment to site. On-site, inspect ducts to confirm that no oil film is present and remove any oil that is present. If ducts contain dust and dirt, clean them immediately, prior to substantial completion and prior to using the ducts to circulate air. HVAC system components or duct work may only be cleaned, coated, or have applied to its surface disinfectants, pesticides or biocides that are registered and particularly labeled for use in HVAC systems by state and federal EPA.

#### **3.4 REFRIGERANT PIPING INSTALLATION**

- A. Total refrigerant piping is to be ASTM B280, Type “ACR” hard drawn copper.
- B. All elbows are to be long radius elbows.
- C. All joints in refrigerant piping are to be brazed using Silfos-5 or equivalent brazing material.
- D. Nitrogen gas is to flow through the piping continuously during brazing operation.
- E. Pressure test system with dry nitrogen to 200 psig using electronic leak detector. Test to no leakage.
- F. Evacuate and charge completed system with refrigerant after testing.
- G. Refrigerant charge is to meet with the manufacturer’s installation instructions.
- H. Horizontal refrigerant piping is to be installed to run level.

#### **3.5 DUCTWORK AND ACCESSORIES**

- A. All duct and fittings are to be sealed using Durodyne Dyn-O-Wrap or equal minimum 3 mil puncture resistant, UV resistant, from the time of manufacture to the time of installation.
- B. All duct and fittings left open during installation are to be fully sealed using Durodyne Dyn-O-Wrap or equal minimum 3 mil puncture resistant, UV resistant, waterproof duct wrap.
- C. Installation:

1. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
2. Connect terminal units to main supply air with galvanized steel duct.
3. Connect diffusers to low pressure ducts in concealed locations with 5 feet maximum length of flexible duct. Hold in place with strap or clamp to prevent duct from collapsing above diffuser.
4. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing.
5. Provide balancing dampers on medium pressure systems where indicated.
6. Provide fire/smoke dampers at locations indicated. Install with required perimeter mounting angles, sleeves, breakaway duct connection, corrosion resistant springs, bearings, bushings, and hinges.
7. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.
8. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire/smoke dampers, and elsewhere as indicated.
9. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated.
10. Provide duct test holes where indicated and required for testing and balancing purposes.
11. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
12. Install diffusers to ductwork with airtight connection.
13. Paint all ductwork visible behind air outlets and inlets matte black.

### 3.6 MECHANICAL SYSTEM AND EQUIPMENT INSULATION

- A. Install all insulation, including duct liner, in strict accordance with the manufacturer's installation instructions and specifications.
- B. Ductwork:
  1. Do not install covering before ductwork and equipment has been tested, and accepted by the Architect.
  2. Ensure surface is clean and dry prior to installation. Ensure insulation is dry before and during application.
  3. Ensure insulation in continuous through inside walls. Pack around ducts with fireproof, self-supporting insulation material, properly sealed.
  4. Finish insulation neatly at hangers, supports, and other protrusions.
  5. Repair separation of joints or cracking of insulation due to thermal movement or poor workmanship.
- C. Piping as applied to all systems:
  1. Install materials after piping has been tested, and accepted by the Architect.
  2. Install materials in accordance with manufacturer's instructions.
- D. Refrigerant piping insulation
  1. General: Insulation shall be provided on all suction refrigerant piping on cooling only systems and all gas and liquid piping is to be insulated on variable refrigerant flow (VRF) systems.

2. Jackets:
  - a. Indoor refrigerant piping:
    - 1) Install PVC jacketing on all elbows in accordance with the manufacturer's installation instructions.
  - b. Outdoor refrigerant piping:
    - 1) Apply 0.016 inch aluminum metal jacket with moisture barrier around pipe and prefabricated metal fittings in accordance with the manufacturer's installation instructions.
    - 2) Fittings: Apply prefabricated metal fittings identical in composition to pipe jacketing in accordance with the manufacturer's installation instructions.

### 3.7 MECHANICAL IDENTIFICATION:

- A. Installation:
  1. Degrease and clean surfaces to receive adhesive for identification materials.
  2. Plastic nameplates: Install with corrosive-resistant mechanical fasteners or adhesive. Plastic nameplates located on tee of t-bar ceilings are to be carefully affixed centered in the depth of the tee and parallel to the edge of the tee for a neat and orderly appearance.
  3. Plastic or metal tags: Install with corrosive-resistant chain.
  4. Plastic pipe markers: Install in accordance with manufacturer's instructions.
  5. Equipment: Identify all equipment with plastic nameplates. Small devices may be identified with plastic metal tags.
  6. Controls: Identify control panels, variable frequency drives and major control components' outside panels with plastic nameplates.
  7. Valves: Identify valves in main and branch piping with tags.
  8. Balancing Dampers: Identify all balancing dampers in concealed areas with fluorescent colored plastic flagging tape, min. 1-3/16" wide. Tape to be long enough so that it can be seen from the access location.
  9. Provide valve chart and schedule in aluminum frame with clear plastic shield. Install at location as directed.

### 3.8 SUPPORTS AND ANCHORS

- A. Fabrication:
  1. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
  2. Design hangers without disengagement of supported pipe.
  3. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

#### B. Pipe hangers and supports:

1. Support horizontal piping as follows:

Pipe Size In Inches	Max. Hanger Spacing In Feet	Hanger Diameter In Inches
1/2 to 1-1/4	6.5	3/8
1-1/2 to 2	10	3/8
2-1/2 to 3	10	1/2
4 to 6	10	5/8



8 to 12  
14 and over

14  
20

7/8  
1

2. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
3. Place a hanger within 12 inches of each horizontal elbow.
4. Use hangers with 1-1/2 inch minimum vertical adjustment.
5. Support grooved pipe and fittings in accordance with manufacturer's requirements.
6. Support vertical piping at every floor and at roof penetrations.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Support riser piping independently of connected horizontal piping.

C. Equipment bases and supports:

1. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

D. Flashing:

1. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, and roofs in accordance with roofing manufacturer's recommendations.
2. Provide acoustical lead flashing around ducts and pipes penetrating building wall from roof-mounted equipment. Flashing to be installed in accordance with manufacturer's instructions for sound control.

E. Sleeves:

1. Where piping or ductwork penetrates ceiling or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk seal airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
2. Install steel escutcheons at finished surfaces.

3.9 SYSTEM TEST AND START UP

- A. Check the installation and connection requirements for conformance with the manufacturer's installation instructions for each piece of equipment.
- B. Perform the step-by-step checkout and startup procedures for each piece of equipment in accordance with the manufacturer's startup instructions.
- C. The Mechanical Contractor is to coordinate the efforts of the Test and Balance Contractor to ensure that all systems are tested and performing as intended.
- D. Make all necessary control and system adjustments and operate the system in its final configuration for a period of ten (10) working days for the purpose of proving satisfactory performance. During this period, instruct such persons as Owner may designate in proper operation, care, and maintenance of the systems.

3.10 ACCEPTANCE REQUIREMENTS:

- A. The Contractor shall be responsible for the completion of all acceptance requirements in the 2016 California Building Energy Efficiency Standards (Title 24). Refer to Specification Section 23 05 00 for additional information on acceptance requirements.

END OF SECTION 23 00 00

SECTION 32 31 19 – DECORATIVE METAL FENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Decorative metal fences and gates.
- B. [Addendum 4] Dual swing barrier gate.**
- C. [Addendum 4] Custom metal fence to match Decorative**

1.3 RELATED SECTIONS

- A. Section 03 30 10 – Cast-in-Place Concrete, for footings, landscape walls, and curbs.

1.4 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
  - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
  - 3. AWS D1.6, "Structural Welding Code - Stainless Steel."
- C. Surface Preparers Qualifications: Members of the American Galvanizers Association or equal, such as painting contractors, approved by the City Representative.
- D. The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.6 REFERENCES

1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.
3. ASTM D523 - Test Method for Specular Gloss.
4. ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.
5. ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
6. ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
7. ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
8. ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
9. ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.
10. ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets.

1.7 SUBMITTALS

- A. Shop Drawings: Provide shop drawings for all shop and field fabrications. Shop drawings shall show all framing materials types (including thickness, sizes, etc.), all fence elements, including framing, connections, supports, and attachments required to install the completed fence assembly. Shop drawings shall show all conditions where there is a change in grade.
- B. Samples:
  1. Submit two samples of each type and pattern of metal fence panels 18in x 18in, for approval, prior to beginning work.
- C. LEED Submittals: See Section 01 35 13.20 for additional requirements; provide the following:
  1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content.
    - a. Include statement indicating costs for each product having recycled content.
  2. Product Data for Credit IEQ 4.2: For field-applied touch up primers, paints, clear coatings, and galvanizing agents, include printed statement of VOC content and chemical components.
- D. Mock-ups:
  1. After approval of samples, fabricate a full-size scale mock-up of one post to post section of fence. Mock-up shall include all finishes, fasteners and connections, other than post footings.

2. Deliver mock-up to project site for review and approval by Owner's Representative.
3. Approved mock-up shall be used to establish the standard against which the completed Work shall be judged. If the contractor chooses, a full panel may be submitted as the mock-up, and then, if approved, incorporated into the completed work, if in the same condition as new at time of final acceptance.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials against weather and contact with damp or wet surfaces.
- B. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

#### 1.9 WARRANTY

- A. All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 20 years from date of original purchase. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.
- B. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufactures warranty shall be guaranteed for five (5) years from date of original purchase.

### PART 2 - PRODUCTS

#### 2.1 PRODUCT

- A. Decorative Metal Fences and Gates:
  1. Basis of Design Product: Ameristar, Montage II, or approved equal, as shown on the drawings.
  2. Material: Steel
  3. Style: Majestic, **[Addendum 4] 3-Rail**
  4. Color: Black
  5. <http://www.ameristarfence.com/residential-ornamental-wrought-iron-steel-fence-montage>
  6. For Ameristar products, contact Ed Carini, Region 1 – West, [ecarini@ameristarfence.com](mailto:ecarini@ameristarfence.com); 510-299-1616; send orders & quote requests to [region1fax@ameristarfence.com](mailto:region1fax@ameristarfence.com), phone 888.333.3422, fax 877.926.3747
- B. **[Addendum 4] Custom Decorative Metal Fence:**
  1. **Provide custom radiused decorative metal fence panel to match Ameristar, Montage II, Majestic style per Section 2.1, A above.**
- C. **[Addendum 4] Dual-Swing Barrier Gate:**
  1. **Basis of Design Product: DuraGate DGT-BS Super-Duty Steel Barrier Gate Square Tubular 10-1/2 - 16 Ft. Long Kit, with 180° Swing and fully-welded joints**

2. **Material: Hot-dipped Galvanized Steel**
3. **Color: Black**
4. **<http://www.gatedepot.com>, 888-818-4283.**

## 2.2 MATERIAL

- A. Steel material for fence panels and posts shall conform to the requirements of ASTM A653/A653M, with a minimum yield strength of 45,000 psi (310 MPa) and a minimum zinc (hot-dip galvanized) coating weight of 0.90 oz/ft<sup>2</sup> (276 g/m<sup>2</sup>), Coating Designation G-90.
- B. Material for pickets shall be 1" square x 14 Ga. tubing. The rails shall be steel channel, 1.75" x 1.75" x .105". Picket holes in the rail shall be spaced 4.715" o.c. Fence posts and gate posts shall meet the minimum size requirements of Table 1.

Table 1 – Minimum Sizes for Montage II Posts			
Fence Posts	Panel Height		
2-1/2" x 12 Ga.	Up to & Including 6' Height		
3" x 12 Ga.	Over 6' Up to & Including 8' Height		
Gate Leaf	Gate Height		
	Up to & Including 4'	Over 4' Up to & Including 6'	Over 6' Up to & Including 8'
Up to 4'	2-1/2" x 12 Ga.	3" x 12 Ga.	3" x 12 Ga.
4'1" to 6'	3" x 12Ga.	4" x 11 Ga.	4" x 11 Ga.
6'1" to 8'	3" x 12 Ga.	4" x 11 Ga.	6" x 3/16"
8'1" to 10'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"
10'1" to 12'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"
12'1" to 14'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"
14'1" to 16'	6" x 3/16"	6" x 3/16"	6" x 3/16"

Table 2 – Coating Performance Requirements		
Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117, D714 & D1654	Corrosion Resistance over 1,500 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60-inch lb. (Forward impact using 0.625" ball).
Weathering Resistance	D822 D2244, D523 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

**Table 3 – Montage II – Post Spacing By Bracket Type**

Span	For INVINCIBLE® 8' Nominal (91-1/2" Rail)				For CLASSIC, GENESIS, & MAJESTIC 8' Nominal (92-5/8" Rail)					
Post Size	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"
Bracket Type	Industrial Flat Mount (BB301)*		Industrial Line 2-1/2" (BB319) 3" (BB320)		Industrial Universal 2.5" (BB302) 3" (BB303)		Industrial Flat Mount (BB301)		Industrial Swivel (BB304)*	
Post Settings ± 1/2" O.C.	94-1/2"	95"	94-1/2"	95"	96"	96-1/2"	96"	96-1/2"	*96"	*96-1/2"
*Note: When using BB304 swivel brackets on either or both ends of a panel installation, care must be taken to ensure the spacing between post and adjoining pickets meets applicable codes. This will require trimming one or both ends of the panel. When using the BB301 flat mount bracket for Invincible style, rail may need to be drilled to accommodate rail to bracket attachment.										

## 2.3 FABRICATION

- A. Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.
- B. Pickets shall be inserted into the pre-punched holes in the rails and shall be aligned to standard spacing using a specially calibrated alignment fixture. The aligned pickets and rails shall be joined at each picket-to-rail intersection by Ameristar's proprietary fusion welding process, thus completing the rigid panel assembly (Note: The process produces a virtually seamless, spatter-free good-neighbor appearance, equally attractive from either side of the panel).
- C. The manufactured panels and posts shall be subjected to an inline electrodeposition coating (E-Coat) process consisting of a multi-stage pretreatment/wash, followed by a duplex application of an epoxy primer and an acrylic topcoat. The minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils (0.058 mm). The color shall be Black. The coated panels and posts shall meet the performance requirements for each quality characteristic shown in Table 2.
- D. The manufactured fence system shall meet the vertical load, horizontal load, and infill performance requirements for Industrial weight fences under ASTM F2408.
- E. Swing gates shall be fabricated using 1.75" x 14ga Forerunner double channel rail, 2" sq. x 12ga. gate ends, and 1" sq. x 14ga. pickets. Gates that exceed 6' in width will have a 1.75" sq. x 14ga. intermediate upright. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding. Gusset plates will be welded at each upright to rail intersection. Cable kits will be provided for additional trussing for all gates leaves over 6'.

- F. Pedestrian swing gates shall be self-closing. **[Addendum 4] Gate leaf width shall be according to plans.** Integrated hinge-closer set (2 qty) shall be ADA compliant that shall include a variable speed and final snap adjustment with compact design (no greater than 5" x 6" footprint). Hinge-closer set (2 qty) shall be tested to a minimum of 500,000 cycles and capable of self-closing gates up to a maximum gate weight of 260 lbs. and maximum weight load capacity of 1,500 lbs. Hinge-closer device shall be externally mounted with tamper-resistant security fasteners, with full range of adjustability, horizontal (.5" - 1.375") and vertical (0 - .5"). Maintenance free hinge-closer set shall be tested to operate in temperatures of negative 20 F to 200 F degrees, and swings to negative 2 degrees to ensure reliable final lock engagement.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. All new installation shall be laid out by the contractor in accordance with the construction plans.

#### 3.2 FENCE INSTALLATION

- A. Fence post shall be spaced according to Table 3, plus or minus 1/2". For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels shall be attached to posts with brackets supplied by the manufacturer. Posts shall be set in concrete footers having a minimum depth of 36" (Note: In some cases, local restrictions of freezing weather conditions may require a greater depth). The "Earthwork" and "Concrete" sections of this specification shall govern material requirements for the concrete footer. Posts setting by other methods such as plated posts or grouted core-drilled footers are permissible only if shown by engineering analysis to be sufficient in strength for the intended application.

#### 3.3 FENCE INSTALLATION MAINTENANCE

- A. When cutting/drilling rails or posts adhere to the following steps to seal the exposed steel surfaces; 1) Remove all metal shavings from cut area. 2) Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry. 3) Apply 2 coats of custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1-3 above will negate warranty. Ameristar spray cans or paint pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of non-Ameristar parts or components will negate the manufactures' warranty.

#### 3.4 GATE INSTALLATION

- A. Gate posts shall be spaced according to the manufacturers' gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles. The manufacturers' gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacturer of the gate and shall be installed per manufacturer's recommendations.



**3.5 CLEANING**

- A. The contractor shall clean the jobsite of excess materials; post-hole excavations shall be removed or scattered uniformly away from posts.
- B. Leave area of work broom clean.

**3.6 PROTECTION**

- A. Protect installed products from damage from weather and other causes during remainder of the construction period.

END OF SECTION 32 31 19

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SECTION 32 84 00 – PLANTING IRRIGATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Division 01 Section "Submittal Procedures."
- B. Division 26 Section "Electrical" for power connection for controller
- C. Division 32 Section "Planting"

1.2 SUMMARY

- A. Drawings and general provisions of the Contract, including Division 01 Specification Sections, apply to this Section.
- B. Provide labor, materials, supplies, equipment, tools, and transportation, and perform all operations in connection with and reasonably incidental to the complete installation of the irrigation system, and guarantee/warranty as shown on the drawings, the installation details, and as specified herein.
- C. Section includes:
  - 1. Procurement of applicable licenses, permits, and fees.
  - 2. Coordination of Utility Locates ("Call Before You Dig")
  - 3. Sleeving for irrigation pipe and wire.
  - 4. Installation of automatic irrigation controller.
  - 5. Connection of electrical power supply to irrigation control system.
  - 6. Preparation of Record Drawings.
  - 7. Maintenance period.
- D. Discrepancies:
  - 1. It is the intent of these plans and specification that the all equipment installed for the irrigation system is complete and workable. It is the Contractor's responsibility to make sure that the equipment furnished is compatible and adheres to all regulations. Any discrepancies should be noted immediately and should be reported to the owner's representative for clarification.
- E. Work not included:
  - 1. Items of work specifically excluded or covered under other sections are:
    - a. Excavation, installation, and backfill of tap into municipal water line.
    - b. Excavation, installation, and backfill of water meter.
    - c. Provision of electrical power supply to irrigation control system.

1.3 DEFINITIONS

- A. Backflow: Any unwanted flow of used or non-potable water or substance from any domestic, industrial or institutional piping system into the pure, potable water distribution system. The direction of flow under these conditions is in the reverse direction from that intended by the system and normally assumed by the Owner of the system (USC, 1998)
- B. Capillary Action – The movement of water through the soil where the water sticks to the sides of very small passages or capillaries between soil particles. (Rain Bird 2011)
- C. Cycle: The operating duration, in minutes or hours, of one or more valves for one irrigation start time. (Water Mgt Committee 2001)
- D. Emitter: The device inside the drip tubing that controls the amount of water flow out of each outlet hole. (Rain Bird 2011)
- E. Flow rate: Volume of flow per unit time, such as discharge from an irrigation sprinkler or emitter; or flow into a zone.
- F. Flush Header – Flexible or rigid pipe and fittings connecting a group of dripline rows and found at the opposite end of the Supply Header (also known as “manifold”). (Rain Bird 2011)
- G. Flush Valve – A valve that can be opened automatically or manually to discharge the water that is in the system of dripline rows and headers to remove any accumulated dirt or debris. (Rain Bird 2011)
- H. Irrigation: The intentional application of water for purposes of sustained plant growth. (Water Mgt Committee 2001)
- I. Irrigation system: Set of components which may include the water source, water distribution network, control components and other general irrigation equipment. (Rain Bird, 1997)
- J. Precipitation rate: Rate at which a sprinkler system applies irrigation water.
- K. Hydrostatic pressure: Pressure in a closed system, without any water movement. (Rain Bird, 1997)
- L. Pressure regulator: Device which maintains constant downstream operating pressure (immediately downstream of the device) that is lower than the upstream pressure. (Rain Bird, 1997)
- M. Record drawing: Set of construction plans, or computer file, including the original design and noting all design deviations. These drawings should also show the location of all major underground components, dimensioned from permanent features. (Water Mgt Committee 2001)
- N. Runoff: Portion of irrigation water that leaves the target area, primarily due to slope or the precipitation rate exceeding the soil infiltration (intake) rate. (Water Mgt Committee 2001).
- O. Supply Header – The combination of flexible or rigid pipe plus fittings that supplies water to many rows of dripline (also known as “manifold”). (Rain Bird 2011)

1.4 REFERENCES (NOT LIMITED TO THE FOLLOWING):

- A. American Standard for Testing and Materials (ASTM) – Latest Edition:
  - 1. D 1784 Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (CPVC) Compounds
  - 2. D 1785 Poly (Vinyl Chloride) (PVC) Plastic Pipe Schedules 40, 80, 120
  - 3. D 2241 Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)
  - 4. D 2464 Poly (Vinyl Chloride) (PVC) Plastic Fittings, Thread, Schedule 80
  - 5. D 2466 Poly (Vinyl Chloride) (PVC) Plastic Fittings, Schedule 40
  - 6. D 2467 Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Socket Type, Schedule 80
  - 7. D 2564 Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
  - 8. D 2287 Flexible Poly Vinyl Chloride (PVC) Plastic Pipe
  - 9. D 2855 Making Solvent – Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings
  - 10. F 656 Poly (Vinyl Chloride) (PVC) Solvent Weld Primer
- B. California Code Of Regulations, Title 24 – Latest Edition:
  - 1. Part 3 – California Electrical Code
  - 2. Part 5 – California Plumbing Code
- C. Underwriters Laboratories, Inc. (UL):
  - 1. UL 651 Schedule 40 and 80 Rigid PVC Conduit.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated,
  - 1. Deliver four (4) copies of submittals to Owner's Representative within 10 working days from date of Notice to Proceed. Furnish information in 3-ring binder with table of contents and index sheet. Index sections for different components and label with specification section number and name of component. Furnish submittals for components on material list. Indicate which items are being supplied on catalog cut sheets when multiple items are shown on one sheet. Incomplete submittals will be returned without review. All submittals shall be in accordance with Section 013300 Submittal Procedures.
  - 2. Materials List: Complete manufacturer's technical data and installation instructions shall be submitted prior to performing any work. Material list shall include the manufacturer, model number and description of all materials and equipment to be used. Quantities of materials need not be included.
  - 3. The Contractor shall furnish the articles, equipment, materials or processes specified by name in the drawings and notes. No substitutions will be allowed without prior written approval by Owner's Representative.
  - 4. Equipment or materials installed or furnished without prior approval of the Owner's Representative may be rejected and the Contractor may be required to remove such materials from the site at his own expense.
  - 5. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

B. Operation and Maintenance Manual:

1. Prepare and deliver to the Owner's Representative, prior to the start of maintenance, all required and necessary descriptive material in complete detail and sufficient quantity properly prepared in two (2) individually bound copies. Describe the material installed in sufficient detail to permit qualified operating personal to understand, operate and maintain all equipment. Each manual shall include the following:
  - a. Index sheet, stating Contractor's address and telephone number.
  - b. Duration of guarantee period with guarantee forms.
  - c. List of equipment with names and addresses of manufacturer's local representative.
  - d. Complete operating and maintenance instructions on all major equipment.
  - e. Spare parts list and related manufacturer information for all equipment.
2. Operation and maintenance manuals shall be delivered to the Owner's Representative 10 calendar days prior to final inspection. The manuals shall describe the material installed.

C. Spare Parts and Equipment

1. Prior to the start of maintenance prepare and deliver to the Owner's Representative, all required spare parts, tools and equipment. Spare parts, tools and equipment shall include but not be limited to the following:
  - a. Two (2) operating keys suitable to operate each type of valve used;
  - b. Two (2) quick coupler valve keys to fit type of couplers used (complete with hose bibb);
  - c. Two (2) quick coupler lock type cover keys;
  - d. One (1) set of automatic controller cabinet keys for each controller used
  - e. Twelve (12) of each bubbler nozzle specified on plans.
  - f. Provide Three (3) sets of maintenance and parts manuals for controller, remote control valves, shut-off valves, quick coupler valves, rotary heads, and all other mechanical devices with moving parts used in this contract. Present in hardback three-ring binders.
  - g. Two (2) 500' rolls of dripline tubing identified on plans.

D. Controller Charts

1. As-built drawings shall be approved in writing prior to preparing charts.
2. Provide two (2) controller charts for each controller supplied, showing area covered by the automatic controller.
3. The chart shall be reduced reproduction of the as-built system. If the controller sequence is not legible when reduced, enlarge it to a size that will be legible when reduced.
4. Charts shall be black line print with a different transparent color used to show area of coverage for each station.
5. Completed and approved charts must be laminated with 10 mil. thick plastic minimum.
6. Charts shall be completed and approved prior to final inspection of the irrigation system.
7. Controller access. The Owner's Representative reserves the right to have complete access to the controller clocks for monitoring and controlling system failures. The Contractor shall provide two (2) sets of all keys necessary for access to the controller clocks within the designated area. The keys will then become the property of the Owner.

1.6 COORDINATION

- A. Complete sleeve installation (not otherwise provided) in coordination with paving and other concrete pours.
- B. Coordinate to ensure that an electrical power source is in place.
- C. Coordinate system installation work specified in other Sections and coordinate with landscape installer to ensure plant material is uniformly watered in accordance with intent shown on drawings.

1.7 RULES AND REGULATIONS

- A. Provide work and materials in accordance with latest edition of National Electric Code, Uniform Plumbing Code as published by the Western Plumbing Officials Association, and applicable laws, regulations and codes of governing authorities.
- B. When contract documents call for materials or construction of better quality or larger size than required by above-mentioned rules and regulations, provide quality and size required by contract documents.
- C. If quantities are furnished either in specifications or on drawings, quantities are furnished for information only. It is Contractor's responsibility to determine actual quantities of material, equipment, and supplies required by the project and to complete independent estimate of quantities and wastage.
- D. Notify Owner's Representative in writing prior to construction about discrepancies between contract documents and existing site conditions or manufacturer's specific recommendations for use of their product.
- E. Contractor is responsible for damage to site amenities during construction. Replace damaged items with identical materials of equal value to match existing conditions. Make replacements at no additional cost to contract price.
- F. All electrical control panels with controls must be built in accordance to N.E.C., U.L. and E.T.L. standards. The electrical components and enclosure must be labeled as a complete U.L. listed assembly with manufacturer's U.L. label applied to the door. All equipment and wiring must be mounted within the enclosure and labeled for proper identification.

1.8 CHECKLIST

- A. Provide a signed and dated checklist and deliver to the Owner's Representative prior to final review of the work.
- B. Use the following format:
  - 1. Confirmation of service pressure: psi, by whom and date.
  - 2. Plumbing permits: if none required, so noted.
  - 3. Materials approvals: approved by and date.
  - 4. Pressure line tests: by whom and date.
  - 5. Record drawings: received by and date.

6. Controller charts: received by and date.
7. Materials furnished: received by and date.
8. Operation and maintenance manuals: received by and date.
9. System and equipment operation instructions: received by and date.
10. Manufacturer's warranties if required: received by and date.
11. Written guarantee: received by and date.
12. Lowering of heads in lawn areas: if incomplete, so state.

1.9 QUALITY ASSURANCE

- A. General: The entire irrigation system, including all work done under this contract, shall be guaranteed against all defects and fault of material and workmanship for a period of one (1) year following the filing of the Notice of Completion. All materials used shall carry a manufacturer's guarantee of one (1) year.
- B. Should any problem with the irrigation system be discovered within the guarantee period, it shall be corrected by the Contractor at no additional expense to the Owner within ten (10) calendar days of receipt of written notice from the Owner. When the nature of the repairs as determined by the Owner constitutes an emergency (e.g. broken pressure line) the Owner may proceed to make repairs at the Contractor's expense. Any and all damages to existing improvement resulting either from faulty materials or workmanship, or from the necessary repairs to correct same, shall be repaired to the satisfaction of the Owner by the Contractor, all at no additional cost to the Owner.
- C. Permits: Obtain and pay for all permits and inspections required by outside agencies.
- D. Ordinances and regulations: Local, municipal and state laws and rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out by the Contractor. Anything contained in the specifications shall not be construed to conflict with any of these rules and regulations or requirements of the same. However, when the specifications and drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by these rules and regulations, the provisions of the specifications and drawings shall take precedence.
- E. Protection: Erect and maintain barricades, warning signs and lights and provide guards as necessary or required to protect all persons on the site.
- F. Underwriters Laboratories: Electrical wiring, controls, motors and devices shall be U.L. listed and so labeled.
- G. Installer qualifications (for solvent): Each person shall be trained by the manufacturer's representative in techniques for making correct joints prior to performing work on the site.
- H. Work of this Section which is allied with the work of other trades shall be coordinated as necessary.
- I. Superintendent: A superintendent satisfactory to the City Representative shall be present on the site at all times during the progress of the work.
  1. The Superintendent shall not be changed, except with the consent of the City Representative.



2. The Superintendent shall be authorized to represent the Contractor.
  - J. Discrepancies: When discrepancies exist between drawings and specifications, and no specific interpretation is issued prior to bidding, the decision regarding this interpretation will rest with the City Representative. The Contractor will be compelled to act on this decision as directed. In the event the installation deviates from the directions given, it shall be corrected at the Contractor's expense.
  - K. Manufacturer's directions: Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturers used in this Contract furnish directions covering points not shown in the drawings and specifications.
  - L. Work called for on the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications.
  - M. The Contractor shall not install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in equipment usage or area dimensions exist that might have been considered in the engineering. Such obstructions or differences shall be brought to the attention of the Owner's authorized representative. In the event this notification is not performed, the Contractor shall assume full responsibility for any revision necessary at no cost to the Owner.
  - N. Any settling of trenches which may occur during the one-year period following acceptance shall be repaired to Owner's satisfaction by the Contractor without any additional expense to the Owner. Repairs shall include the complete restoration of all damage to planting, paving or other improvements of any kind as a result of the work.
- 1.10 WATER METER:
- A. Refer to civil engineer's documents for water meter information.
- 1.11 BACKFLOW PREVENTION DEVICE:
- A. Refer to Civil section 33 10 00 Water Utilities.
- 1.12 POINT OF CONNECTION
- A. Make connection of irrigation system main line at the approximate locations shown on the plans downstream of a backflow prevention device (see section 33 10 00 Water Utilities).
- 1.13 DRAWINGS
- A. The drawings are diagrammatic only. It is the intent of the plans and specifications that the irrigation system shall efficiently and uniformly irrigate all areas according to horticultural and soil requirements, and that it shall be complete in every respect and shall be ready for operation to the satisfaction of the Owner.
  - B. Due to the scale of drawings, it is not possible to indicate all offsets, fittings, sleeves, etc. which may be required. Carefully investigate the structural and finished conditions affecting all of this

work and plan this work accordingly, furnishing such fittings, etc. as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting and architectural features.

1.14 PROJECT RECORD (AS-BUILT) DRAWINGS:

- A. Document changes to design. Maintain on-site and separate from documents used for construction, one complete set of contract documents as Project Documents. Do not permanently cover work until accurate “as-built” information is recorded.
- B. Record pipe and wiring network alterations on a daily basis. Record work that is installed differently than shown on construction drawings. Record accurate reference dimensions, measured from at least two permanent reference points, of each irrigation system valve, each backflow prevention device, each controller assembly, each sleeve end, each stub-out for future pipe or wiring connections, and other irrigation components enclosed within valve box.
- C. Turn over “Record Drawings” to Construction Manager. Completion of Record Drawings is required prior to final construction review at completion of irrigation system installation.
- D. Record dimensioned locations and depths for each of the following:
  - 1. Point of connection.
  - 2. Sprinkler pressure line (mainline) routing. (Provide dimensions for each 100 lineal feet [maximum] along each routing and for each change in direction.)
  - 3. Flow meters.
  - 4. Gate Valves.
  - 5. Sleeving/ Conduits.
  - 6. Junction Boxes.
  - 7. Remote Control Valves
  - 8. Quick Coupling Valves
  - 9. Control Wire Routing
- E. Other related items as may be directed by the Owner’s representative.
- F. Locate all dimensions from two permanent points (buildings, monuments, sidewalks, curbs or pavements).
- G. Record all changes which are made from the Contract Drawings, including changes in the pressure and non-pressure lines.
- H. Record all required information on a set of black line prints of the drawings. Do not use these prints for any other purpose.
- I. Maintain information daily. Keep drawings at the site at all times and available for review by the Owner’s representative.
- J. When record drawings have been approved by the Owner’s representative, transfer all information to a set of reproducible prints using permanent India ink. Changes using ballpoint pens are not acceptable.

- K. Make dimensions accurately at the same scale used on original drawings or larger. If photo reduction is required to facilitate controller chart housing, notes or dimensions must be a minimum 1/4 inch in size.
- L. Reproducible prints (5 maximum) will be furnished by the Owner's representative at cost for printing and handling.
- M. Use appropriate eradicating fluid for removing original lines and dimensions where changes are made. Completed reproducible shall be equal to the original drawings.
- N. Controller Charts. On the inside surface of the cover of each automatic controller, the Contractor shall prepare and mount a chart showing the valves and sprinkler heads serviced by that particular controller. All valves shall be numbered to match the operation schedule and the drawings. Only those areas controlled by that controller shall be shown. This chart shall be a plot plan, entire or partial, showing building, walks, roads and walls. A photostatic print of this plan, reduced as necessary, and legible in all details, shall be made to size that will fit into the controller cover. Do not prepare charts until record drawings have been approved by the Owner's Representative. Provide one controller chart for each automatic controller installed. Identify the area of coverage of each remote-control valve, using a distinctly different pastel color, drawn over the entire area of coverage. Charts must be completed and approved prior to final review of irrigation system. This print shall be approved by the Owner's representative and shall be hermetically sealed in 20 mil plastic (2-10 mil Pieces). This shall then be secured to the inside of the cover. Show controller designation on each chart

1.15 DELIVERY, STORAGE, STOCKPILING, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.
- B. Handling of PVC Pipe and Fittings: The Contractor is cautioned to exercise care in handling, loading, unloading and storing of PVC fittings. All PVC pipe shall lie flat so as not to subject it to undue bending or concentrated external load at any point. Any section of pipe that has been dented or damaged will be discarded and, if installed, shall be replaced with new piping. Pipe and fittings shall not be stored in direct sunlight.
- C. Bulk Materials:
  - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
  - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

1.16 PROJECT CONDITIONS

- A. Site Inspections:

1. Contractor must verify construction site conditions and note irregularities affecting work of this section. Report irregularities in writing to Owner's Representative prior to beginning work.
2. Commencement of work implies acceptance of existing site conditions.

B. Utility Locates ("Call Before You Dig")

1. Arrange and coordinate Utility Locates with local authorities prior to construction.
2. Repair underground utilities that are damaged during construction. Make repairs at no additional cost to contract price.

C. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by the Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:

1. Notify Owner's Representative no fewer than two days in advance of proposed interruption of each service or utility.
2. Do not proceed with interruption of services or utilities without the Owner's written permission.

1.17 CONSTRUCTION REVIEW

- A. The purpose of on-site reviews by Construction Manager is to daily observe work in progress, Contractor's interpretation of construction documents, and to address questions with regard to installation.
1. Schedule reviews for irrigation system layout or testing with Construction Manager as required by these specifications.
  2. Impromptu reviews may occur at any time during project.
  3. A review will occur at completion of irrigation system installation and Project Record Drawing submittal.

1.18 GUARANTEE/WARRANTY AND REPLACEMENT

- A. The purpose of guarantee/warranty is to ensure that Owner receives irrigation materials of prime quality, installed and maintained in thorough and careful manner.
1. Guarantee/warranty irrigation materials, equipment, and workmanship against defects for period of one year from formal written acceptance by Owner's Representative. Fill and repair depressions. Restore landscape, utilities, structures and site features damaged by settlement of irrigation trenches or excavations. Repair damage to premises caused by defective items. Make repairs within seven days of notification from Owner's Representative.
  2. Replace damaged items with identical materials and methods per contract documents or applicable codes. Make replacements at no additional cost to contract price.
- B. Guarantee/warranty applies to originally installed materials and equipment, and replacements made during guarantee/warranty period.

PART 2 - PRODUCTS

2.1 SPECIFYING BY NAME

- A. Whenever any material is specified by name and number thereof, such specifications shall be deemed to be used for the purpose of facilitating a description of the materials and established quality, and shall be deemed and construed to be followed by the words "or approved equal". No substitution will be permitted which has not been submitted for approval to the Owner within 30 days after the contract has been awarded. Three (3) copies of descriptive literature, including pressure loss curves, nozzle performance characteristics, etc., shall be furnished for any materials submitted as "equal" substitutes. No item will be considered as "equal" if it is constructed of different materials or alloy or is of a different principle of operation. Piping, tubing, conduit, valve, or any device through which the flow of water must pass shall not cause a greater resistance, turbulence, or pressure loss due to friction than that material as engineered and designed into this system.
- B. Pressure loss curves shall be certified by an impartial commercial testing laboratory with all costs for tests and reports being paid for by the Contractor wishing to make the substitution.
- C. Contractor shall submit letter (with material list) stating his reasons for any substitution and showing amount of credit offered if substitution should be acceptable.

2.2 GENERAL

- A. Due to the scale of drawings, it is not possible to indicate all offsets, fittings, sleeves, etc. which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all his/ her work and plan his/her work accordingly, furnishing such fittings, etc., as may be required to meet such conditions. Drawings are generally diagrammatical and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting and architectural features. Wherever possible locate all piping in planter areas.
- B. Use only materials of brands and types noted on drawings, specified herein, or approved equal.

2.3 QUALITY

- A. Use new materials without flaws or defects.

2.4 SUBSTITUTIONS

- A. Use specified equipment, or pre-approved equal. Alternative equipment must be approved by Owner's Representative prior to bidding. Changes and associated design costs to accommodate alternative equipment are Contractor's responsibility.
- B. Pipe sizes referenced in the construction documents are minimum sizes, and may be increased at Contractor's option.

2.5 SLEEVING

- A. Provide sleeve beneath hardscape for irrigation pipe. Provide separate sleeve beneath hardscape for wiring bundle.

- B. Provide PVC Schedule 40 pipe with solvent welded joints for sleeving material beneath hardscape.
- C. Pipe shall be made from NSF approved, Type I, Grade II PVC compound conforming to ASTM resin specification D-1784. All pipes must meet requirements set forth in Federal Specification PS-22-70 (Solvent-Weld Pipe).
- D. Sleeve sizing: A minimum of twice the nominal diameter of solvent-welded pipe or wiring bundle, or as indicated on drawings. Pipe sleeves installed under paving and walkways shall be PVC Schedule 40.

2.6 THRUST BLOCKS:

- A. Use 3,000 PSI concrete. Use commercially pre-mixed concrete unless written approval is provided by Owner's Representative prior to construction.
- B. Use 6 mil plastic protective sheeting.
- C. Use No. 4 Rebar.

2.7 Tracer Wires

- A. A No. 12. Green Type TW plastic-coated copper tracer wire shall be installed with non-metallic main lines.

2.8 PVC PIPE (GENERAL)

- A. All pipe to be permanently and continuously marked with manufacturer's name, Nominal pipe size (IPS) and schedule or class(D-1785-68 for schedule pipe), Pressure Rating (P.S.I.), manufacturer's lot number, Date of Extrusion, NSF approval and U.P.C. Shield Logo (IAPMO Approval). Pipe with dents, ripples, wrinkles, die or heat marks is not acceptable. Pipe shall be delivered to the site in 20 foot lengths.

2.9 PRESSURE MAIN LINE PIPING

- A. Pressure main line piping shall be solvent welded type.
- B. Pressure mainline piping for all pipe diameter [Addendum 4] 2-inch ~~2-1/2 inches~~ and larger shall be PVC Class 315, with Schedule 40 fittings.
- C. PVC Class 315 pressure mainline piping shall conform to the following:
  - 1. SDR-13.5, rated at 315 PSI
  - 2. Dimensions and tolerances established by ASTM Standard D2241.
  - 3. Pipe shall be made from NSF approved Type I, Grade 1 PVC compound conforming to ASTM resin specifications D-1784 and d 1785. All pipe must meet requirements as set forth in Federal Specification PS-22-70, with an appropriate standard dimensions (S.D.R.), (Solvent-Weld Pipe).

- D. Pressure mainline piping for all pipe diameter [**Addendum 4**] ~~1-12-inches~~ **2-inches** and smaller shall be PVC Schedule 40, with Schedule 40 fittings.
- E. PVC Schedule 40 pressure mainline piping shall conform to the following:
  - 1. Dimensions and tolerances established by ASTM Standard D2241.
  - 2. Pipe shall be made from NSF approved Type I, Grade I Polyvinyl Chloride (PVC) compound with a Cell Classification of 12454 per ASTM D1784. The pipe shall be manufactured in strict compliance to ASTM D1785 and D2665 (where applicable), consistently meeting and/or exceeding the Quality Assurance test requirements of these standards with regard to material, workmanship, burst pressure, flattening, and extrusion quality.
- F. Size as shown on drawings.
- G. Use primer and solvent cement as set forth in these specifications.
- H. No ring tight piping allowed – All connections to be solvent weld.

2.10 NON-PRESSURE LATERAL PIPING:

- A. Non-pressure buried lateral line piping shall be PVC Schedule 40 with solvent-weld joints, and Schedule 40 fittings.
- B. PVC Schedule 40 non-pressure lateral piping shall conform to the following:
  - 1. Dimensions and tolerances established by ASTM Standard D2241.
  - 2. Pipe shall be made from NSF approved Type I, Grade I Polyvinyl Chloride (PVC) compound with a Cell Classification of 12454 per ASTM D1784. The pipe shall be manufactured in strict compliance to ASTM D1785 and D2665 (where applicable), consistently meeting and/or exceeding the Quality Assurance test requirements of these standards with regard to material, workmanship, burst pressure, flattening, and extrusion quality.
- C. Except as noted above, all requirements for non-pressure lateral line pipe shall be the same as for solvent-weld pressure main line pipe as set forth in these specifications.

2.11 PIPE FITTINGS:

- A. Fittings to be standard weight, Schedule 40, injection molded PVC. Comply with ASTM – D17854, cell classification 1345B. Threads, where required, injection molded type. Tees and ells: side gated. Threaded nipples: Standard weight, Schedule 80 with molded threads.
- B. All fittings shall bear the manufacturer's name, or trademark, material designation, size, applicable I.P.S. schedule and NSF seal of approval.
- C. Threaded PVC nipples: Schedule 80, Type 1, 3-inch minimum length, except where detailed otherwise on drawings. PVC domestic main to drinking fountains shall be PVC Schedule 80 solvent welded plastic pipe; gray in color, meeting ASTM D-1785.

**2.12 SOLVENT PRIMER AND CEMENT:**

- A. Primer: For PVC solvent weld connections shall be as recommended by the manufacturer of the PVC pipe. Primer shall be chemically compatible with the pipe, fittings and solvent. No primer need be used if "Christy's Red Hot Blue Glue" is used as solvent material.
- B. External Surface Cement: For PVC solvent weld connections shall be as recommended by the manufacturer of the PVC pipe. Solvent shall be chemically compatible with the pipe, fittings and primer. Use solvent cement conforming to ASTM Standard D2564.
- C. When gluing flexible PVC tubing, the use of both a primer and glue formulated for use with flexible PVC should be used. Consult with tubing manufacturer.

**2.13 PIPE JOINT COMPOUND:**

- A. Joint compound to be non-hardening, formulated for threaded connections on water carrying pipe, Lasco Blue Pipe thread sealant or approved equal.

**2.14 PIPE THREAD TAPE:**

- A. 100% virgin Teflon pipe thread tape.

**2.15 CORROSION PROTECTION:**

- A. Provide polyethylene wrap a minimum of six (6) mils thickness for all metal pipe, fittings, tie-rods, valves, and other appurtenances. The raw material must meet or exceed:
  - 1. Type 1, Class A Grade E-1, in accordance with ASTM Standard Designation D-1248.
  - 2. Tensile Strength – 1,200 PSI minim.
  - 3. Elongation – 300% minimum.
  - 4. Dielectric Strength – 800 V/Mil thickness minimum.

**2.16 MAINLINE ISOLATION BALL VALVES**

- A. Ball valves 2 inches or smaller shall be produced of shall be produced of forged brass. End connectors shall be thread type.
- B. Valve body shall be two-piece, full port with blowout-pross stem and PTFE seats.
- C. Valve ball shall be brass, chrome plated.
- D. Valve stem shall be brass.
- E. Valve O-rings shall be made of Fluorocarbon (FKM).
- F. Valves shall be operated by a handle. Handle shall be stainless steel.
- G. All ball valves shall have a cold working pressure of 600 PSI.



- H. Ball valves shall be manufactured by Nibco. Model shall be as shown on drawings or approved equal.

#### 2.17 ISOLATION GATE VALVES

- A. ~~[Addendum 4] Isolation Gate Valves 3 inches and larger: Cast Iron ASTM A 126 Class B body, 125-pound saturated steam rated; with screwed joints; non-rising stem; screwed bonnet solid disc. Provide with square operating nut and flanged ends.~~
- A. Isolation Gate Valve 2-1/2 inches and smaller: ASTM B62 brass body, 150-pound saturated steam rated; with screwed joints; non-rising stem; screwed bonnet solid disc. Provide with brass or bronze hand wheel and treaded ends.

#### 2.18 QUICK COUPLER VALVES

- A. Quick coupler valves shall be Factory-fabricated, bronze or brass, two-piece assembly. Include coupler water-seal valve; removable upper body with spring-loaded or weighted, rubber-covered cap; hose swivel with ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet; and operating key. Provide with Vandal-resistant locking feature. Include two matching key(s).
- B. Quick coupler valves shall have a two-piece body, constructed of red brass with a wall thickness guaranteed to withstand normal working pressure of 150 PSI without leakage. The cover shall be self-closing, locking hinge type constructed of red brass with leather like yellow vinyl cover bonded to it in such a manner that it becomes a permanent type cover.
- C. The valve body shall have a 1-inch Female National Pipe Thread (FNPT) inlet. The valve shall be opened and closed by a 1-inch, single lug brass key of the same manufacturer having 1-inch Male National Pipe Thread (MNPT) and 3/4-inch Female National Pipe Thread (FNPT) outlets.
- D. Manufacturers: Subject to compliance with requirements, provide product by Signature Control Systems, Inc. Model as indicated on drawings or as approved equal.

#### 2.19 REMOTE-CONTROL VALVES

- A. The remote-control valve shall be normally closed, 24 VAC solenoid electronically-actuated globe pattern, spring-loaded diaphragm type.
- B. The valve shall be available in a globe configuration with 1-, 1-1/2- or 2-inch Female National Pipe Thread (FNPT) inlet and outlet. When specified, the valve shall be configured with British Standard Pipe threads. The valve shall be equipped with a flow control mechanism with removable handle that will regulate flow from full on to completely off.
- C. The body and bonnet shall be molded of non-corrodible, glass-reinforced nylon, rated to 220 PSI. The body of the valve shall have brass inserts, with through-holes, which will accept the bonnet bolts. The bonnet bolts shall be serviceable with a slotted screwdriver, Phillips screwdriver, or a hex wrench, and shall be held captive in the bonnet when the bonnet is removed from the valve body. The diaphragm assembly shall be of molded construction, reinforced with nylon fabric and have a thermoplastic elastomer seating material. The valve shall be equipped with an internal filter as well as a self-cleaning metering rod, so only clean water can enter the solenoid chamber. An optional filter cleaning system that cleans a stainless

steel filter each time the valve opens and closes, shall be available. All metal parts internal to the valve shall be manufactured from corrosion-resistant stainless steel.

- D. The valve shall be available with an adjustable pressure regulating device with a calibrated dial for setting of the outlet pressure. (The regulator shall be capable of adjusting the outlet pressure from between 20 and 100 PSI when inlet pressure is 15 PSI or greater than regulated outlet pressure. The regulated downstream pressure shall remain constant regardless of variations in upstream pressure. The regulation shall be maintained when valve is manually operated with use of internal bleed valve. The regulator should be capable of regulating upstream pressures from 35 psi to 220 psi.
- E. The standard solenoid shall be a 24 VAC unit with a 370mA inrush current and 190mA holding current at 60 cycles and a 475 mA inrush current and 230 mA holding current at 50 cycles. When specified, the unit shall be equipped with a DC latching solenoid for use with battery-operated controllers. The solenoid shall be an encapsulated, one-piece unit with captive plunger. It shall be equipped with manual internal bleed capability to release the upper chamber water to the downstream piping, allowing the valve to open
- F. Manufacturer: Subject to compliance with requirements, provide product by **[Addendum 4] Rain Bird Corporation** ~~Hunter Industries Incorporated~~. Model as indicated on drawings or as approved equal.
- G. Install with ball valve and union before remote control valve when not grouped within mainline manifold . Labeled with Christy ID tags or approved equal.

## 2.20 DRIP ZONE CONTROL KIT

- A. General
  - 1. ~~**[Addendum 4]-Control zone kit assemblies for drip irrigation zones must include a valve, filtration and pressure regulation to meet the flow requirements of the zone. Where necessary a check valve shall also be installed.**~~
  - 1. Components shall be sized according to the hydraulic demands of the system.
  - 2. When incoming PSI is less than 55PSI, kit shall be installed without pressure regulation device.
- B. ~~**[Addendum 4] Irrigation Control Zone Kits (Flows from 1 to 20 GPM)**~~ Pressure Reducing Filter
  - 1. **Pressure Regulating Filter (PRF) combines filtration and pressure regulation in one integrated unit for protection of downstream components of drip irrigation system. PRF component specifications include: Compact "Y" filter body and cap configuration constructed of glass-filled, UV-resistant polypropylene, with 120 PSI (8,3 bar) operating pressure rating. Maximum dimensions of filter body; Height: 4 1/2" (11,4 cm), Length: 5 1/2" (14 cm), Width: 2" (5,1 cm); Standard 200 mesh (75 micron) filter screen constructed of durable stainless steel attached to a polypropylene frame. Screen is serviceable for cleaning purposes by unscrewing cap from filter body and removing filter element; Normally-open pressure regulating device with preset outlet pressure of approximately 30 PSI (2,1 bar). Pressure regulating device allows full flow with minimal pressure loss unless inlet pressure is greater than preset level. As inlet pressure increases above preset level, internal**

spring compresses to reduce downstream pressure; Male threaded 3/4" (19 mm) inlet and outlet connections.

- ~~1. The valve shall be a normally closed, electronically actuated, hydraulic, remote-control valve. The valve shall be equipped with a non-rising stem-type, manual flow control mechanism. This mechanism will be operable by hand that will regulate flow from full on to completely off. When specified for use with reclaimed water, a reclaimed water identifier handle shall be available.~~
- ~~2. The standard solenoid shall be a 24 VAC unit with a 350 mA inrush current and 190 mA holding current at 60 cycles and a 370 mA inrush current and 210 mA holding current at 50 cycles. When specified, the unit shall be equipped with a DC latching solenoid for use with 12-volt battery-operated controllers. The solenoid shall be an encapsulated, one-piece unit with captive plunger. It shall be equipped with manual internal bleed capability to release the upper chamber water to the downstream piping, allowing the valve to open. The valve shall have an external manual bleed screw that provides an additional method for manual operation of the valve.~~
- ~~3. The body and bonnet shall be molded of non-corrodible, glass-reinforced nylon, rated to 220 PSI (15 bars, 1500 kPa). The body of the valve shall have brass inserts, with through-holes, which will accept the bonnet bolts. The bonnet bolts shall be serviceable with a slotted screwdriver, Phillips screwdriver, or a hex wrench, and shall be held captive in the bonnet when the bonnet is removed from the valve body. The diaphragm assembly shall be of molded construction, reinforced with nylon fabric and have a thermoplastic elastomer seating material. The valve shall be equipped with an internal filter as well as a self-cleaning metering rod, so only clean water can enter the solenoid chamber. All metal parts internal to the valve shall be manufactured from corrosion-resistant stainless steel. A perforated diaphragm support ring shall fit into the valve body just below the diaphragm to relieve stress on the diaphragm when the valve is closed.~~
- ~~4. The valve shall have a 1-inch Female National Pipe Thread (FNPT) inlet and outlet. All valve parts shall be serviceable after installation by unscrewing the bonnet bolts, and removing the bonnet from the valve body to access the internal components. This may be accomplished without removing the valve body from the line.~~
- ~~5. The filter/regulator shall be a combination filter and pressure regulator assembly. The filter/regulator will be capable of operating between 20–120 PSI with a flow range of between 0.5–15 GPM / 30–900 GPH. The downstream pressure shall be 40 PSI depending on the specified model.~~
- ~~6. The filter/regulator shall be available in an in-line configuration. The filter/regulator will have a 1-inch Male National Pipe Thread (MNPT) inlet and 3/4-inch Female National Pipe Thread (FNPT) outlets.~~
- ~~7. The housing and regulator shall be molded of non-corrodible PVC, rated to 150 PSI. All internal portions of the assembly shall be of molded construction and shall have durable materials that are non-destructible in severe conditions.~~

- ~~8. The filter/regulator shall be equipped with a 150 mesh stainless steel filter, so only clean water can be discharged through the regulator. The filter assembly must have removable cap for easy service and cleaning.~~
- ~~9. The filter/regulator shall be standard with a non-adjustable pressure-regulating device that is factory calibrated for the correct outlet pressure. The regulator shall be capable of reducing the outlet pressure to 25 or 40 PSI (1.7 or 2.8 bar; 170 or 280 kPa) depending on the specified model when the inlet pressure is 15 PSI (1.0 bars; 103 kPa) or greater than the regulated outlet pressure. The regulated downstream pressure shall remain constant regardless of variations in upstream pressure.~~
- ~~10. The valve and filter/regulator assembly shall be rated for use up to 120 degrees F.~~
- ~~11. Manufacturer: Subject to compliance with requirements, provide control zone kits with an automatic irrigation control valve. Model as indicated on drawings or as approved equal.~~

C. [Addendum 4] Irrigation Control Zone Kits (Flows less than 1gpm) Pressure Regulating Filter

1. Pressure Regulating Filter (PRF) combines filtration and pressure regulation in one integrated unit for protection of downstream components of drip irrigation system. PRF component specifications include: Compact "Y" filter body and cap configuration constructed of glass-filled, UV-resistant polypropylene, with 120 PSI (8,3 bar) operating pressure rating. Maximum dimensions of filter body; Height: 4 1/2" (11,4 cm), Length: 5 1/2" (14 cm), Width: 2" (5,1 cm); Standard 200 mesh (75 micron) filter screen constructed of durable stainless steel attached to a polypropylene frame. Screen is serviceable for cleaning purposes by unscrewing cap from filter body and removing filter element; Normally-open pressure regulating device with preset outlet pressure of approximately 40 PSI (2,8 bar). Pressure regulating device allows full flow with minimal pressure loss unless inlet pressure is greater than preset level. As inlet pressure increases above preset level, internal spring compresses to reduce downstream pressure.; Male threaded 1" (25 mm) inlet and outlet connections.
- ~~1. The Low Volume Control Zone Kit shall a completely assembled assembly comprised of a 1" 24VAC valve, 3/4" filter and low flow pressure regulator. It is designed to operate zones ranging from 0.25 - 4.4 GPM, provide filtration of 140 mesh (115 microns), and downstream outlet pressure of 42 psi.~~
- ~~2. Valve: The valve shall be a 1" S-80 Electric Control Valve shall have 1" threaded inlet and outlet connections. The valve body shall be made of Glass Reinforced Polyamide. The diaphragm shall be made of Natural Rubber and the diaphragm seat made of Glass Reinforced Polyamide. Spring shall be made of SST302. Nuts, bolts and washers should be made of SST 304.~~
- ~~3. Valve: The valve is an electric on/off valve and shall be capable of opening when an electric signal is sent by a controller. The minimum operating pressure is 7 psi. The maximum operating pressure is 145 psi. The minimum operating flow is 0.01 GPM and the maximum operating flow is 44 GPM.~~

- ~~4. Valves are equipped with internal filters and clog free labyrinth mechanism to assure that the top cap of the valve is receiving clean water at all times. Based on water quality, it is recommended to periodically maintain the valves by visually inspecting the internal parts (after one year, then after two years).~~
- ~~5. Filter: The filter shall be a multiple disc filter with color-coded filter elements indicating the mesh size of the element being used. The discs shall be constructed of chemical-resistant thermoplastic for corrosion resistance. The disc filter body shall be molded of black plastic with male pipe threads for both inlet and outlet. The disc filter shall be capable of periodic servicing by unscrewing a threaded cap or unlatching the band. The disc filter ring color coding shall be Black (140 Mesh /115 Mieron).~~
- ~~6. Filter: The filter shall be capable of filtering suspended particles from water. The filter shall be capable of operating in a range of flows up to 17 GPM. Disc filters can be installed downstream of the remote control valve to allow for periodic servicing when the remote control valve is not operating. It can be installed upstream of the remote control valve if the disc filter is specified with manual shut-off valve or when a line-sized shut-off valve is also specified to allow for periodic servicing with a pressurized main line. Recommended installation of disc filters shall be as specified. It may be installed below grade positioned in a valve box large enough to remove the disk filter cap and internal disc element, or above grade.~~
- ~~7. The Pressure Regulator shall be a Netafim spring-operated, in-line piston-type regulator. The body shall be molded of black plastic with 3/4" female/female pipe threaded inlet and outlet. Directional arrows shall show flow direction of water.~~
- ~~8. Pressure Regulator: The Pressure Regulator shall be able to respond immediately to any inlet pressure variation. The regulator shall be capable of regulating downstream pressure to 42 psi. The Pressure Regulator shall operate in a flow range of 0.25 - 4.4 GPM. Maximum pressure at inlet shall not exceed 145 psi.~~
- ~~9. The solenoid operates within a plus minus 10% of the nominal voltage. For example, a 24VAC will be able to actuate between 22 and 26 volts. In addition, an inrush and holding currents are necessary to maintain the valve in open position, of 220 and 95 mA, respectively. The solenoid includes a manual override that simulates activation of the controller, when the controller is not engaging the solenoid. If the controller is engaging the solenoid, the manual override is not functional. For latching solenoid operation, in addition to a 9V battery operation, a minimum pulse length is required of 25 milliseconds.~~
- ~~10. The manual flow control stem is used to limit the maximum flow across the valve, and can be used as a manual shutoff of the valve.~~
- ~~11. Water temperature shall not exceed 140 F.~~
- ~~12. Manufacturer: Subject to compliance with requirements, provide control zone kits with an automatic irrigation control valve. Model as indicated on drawings or as approved equal.~~

2.21 [ADDENDUM 4] ~~HYDROMETER~~ MASTER VALVE:

- A. Description: Model as indicated on drawings or approved equal, ~~and~~ fully compatible with the automatic controller. ~~and providing a combination of the following in a single unit.~~
- ~~1. Master Valve/ Valve~~
  - ~~2. Water Metering~~
  - ~~3. Flow Monitoring~~
- B. Valve shall be Normally Closed.
- C. Construction:
- ~~1. The hydrometer shall be constructed with a cast iron body with epoxy coating.~~
  - ~~2. The hydrometer shall be a double-chambered valve design with a globe configuration designed for a no-straight pipe installation.~~
  1. Connection configuration shall be threaded
  2. Cast Iron and Bronze
- D. Operation:
1. Maximum working pressure shall be [Addendum 4] ~~235~~ 200 psi with a minimum working pressure of ~~14~~ 2 psi.
- E. Manufacturer: Subject to compliance with requirements, provide product by [Addendum 4] ~~Netafim USA~~ **Griswold Controls**. Model as indicated on drawings or as approved equal.

2.22 CONTROL WIRING

- A. Connection between the automatic controllers and the electric control valves shall be made with direct burial copper with AWG-U.F. 600 volt. Pilot wires shall be a different color wire for each automatic controller. Common wires shall be white with different color strip for each automatic controller. Install in accordance with valve manufacturer's specifications and wire chart. In no case shall wire size be less than: Pilot wires to be minimum size to be #14-1 UF. Common shall be a minimum size to be #12-1 UF. Wire to be sized according to distance and demand.
- B. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines wherever possible.
- C. Where more than one wire is placed in a trench, the wiring shall be taped together at an interval of 10-feet.
- D. An expansion curl should be provided within 3 feet of each wire connection and at each change of direction. Provide a two-foot expansion loop for every 100 feet. Expansion curls shall be formed by wrapping at least five (5) turns of wire around a 1" diameter pipe, then withdrawing the pipe.
- E. Field splices between the automatic controller and electrical control valves will not be allowed without prior approval of Owner's Representative.
- F. Contractor shall provide one extra wire for every three (3) valves and two (2) wires shall be provided for every valve in any isolated area and the extra wires shall extend past the last valve in a group and as indicated on plans. Extra wires shall be orange in color and looped in every valve box and made accessible for future if needed.

- G. No wire splices shall be permitted unless run is longer than 2500 feet or approved by Owner's Representative.
- H. All communication wire for controllers and sensors shall be installed in electrical conduit not less than 3/4 inches on runs less than 100 feet and 1 inch on runs greater than 100 feet.

2.23 WATERPROOF CONNECTORS

- A. Waterproof connectors to be Spears DS-400, prefilled Dri-Splice Wire Connector with crimp sleeves or approved equal for use with waterproof under-ground wire connections.
- B. Wire connector shall be pre-filled with dielectric silicone sealant.

2.24 [ADDENDUM 4] AUTOMATIC IRRIGATION CONTROLLER AND COMPONENTS

~~A. Automatic Irrigation Controller and components shall be as listed on plans.~~

~~B. Automatic Irrigation Controller shall be compatible with Rain Master's iCentral Software.~~

A. Wall Mount Powder Coated Enclosure:

1. Pre-assembled controller shall be: Height 15.7"/40 cm, Width 15.7"/40 cm, Depth 6.8"/18 cm.
2. The enclosure shall be powder-coated 16 gauge (1.5mm) G90 galvanized steel, with approximately 5 mil coating.
3. Surge protection shall include a self-resetting thermal circuit breaker in the transformer, glass 250V fast blow fuse, positive temperature coefficient (PTC) breakers at key points, and gas-filled spark gap arresters where necessary.
4. Controller shall include copper-clad steel ground lug for connection to earth ground hardware.
5. A 751CH key lock shall be mounted in the enclosure door for security.
6. Enclosure shall have rounded corners to prevent injury to pedestrians.
7. Enclosure shall be furnished with a separate steel wall mounting bracket to ease installation, and a means of securing the controller to the wall internally once the enclosure is hung on the bracket.
8. Controller shall provide a conduit opening for AC power wiring, and 8 additional access holes for wiring ingress, including earth ground wire.
9. Controller shall feature a pre-wired external SmartPort connector for remote control, protected from the elements with a tethered rubber cap.

B. Controller shall be able to operate in all indoor and outdoor environments when installed according to specifications.

C. Wall mount and pedestal enclosure and installed equipment shall carry a conditional 5-year warranty.

D. Control Display

1. Display shall be 4.125" diagonal full-color illuminated LCD suitable for outdoor viewing.

**E. Control Panel**

1. Panel shall be reversible to allow for full access to programming, operations, and diagnostics when panel is open, exposing internal modules, components, and wiring.
2. Panel shall include 'soft keys' labeled for different functions in different screens to facilitate programming and navigation.
3. Panel shall include an SD card reader for storage of backups and logs, as well as field updates of software

**F. Controller Power**

1. The controller shall accept either 120VAC or 230VAC primary power, 50/60Hz. The controller transformer shall include a safety ground wire connection.
2. The controller shall offer a constantly powered 24VAC terminal for sprinkler wire test purposes or specified auxiliary power functions

**G. Controller Surge Protection**

1. The controller transformer shall be equipped with an easily replaced standard 250V fast blow 5x20mm glass fuse, and shall be supplied with at least two spare fuses
2. The controller transformer shall include an internal, self-resetting thermal circuit breaker
3. Internal components shall include self-resetting PTC micro-breakers at critical paths
4. Power Supply Board shall include MOV and spark gap surge isolation

**H. Station Modules**

1. Controller shall provide 9 separate station module slots arranged in two staggered decks.
2. Each station output shall supply up to .800 mA 24VAC per station current for solenoid activation
3. Each station output module shall display its version and the status of each station in the diagnostic display
4. The controller shall have a base model capacity of 12 stations, consisting of two 6-station output modules

**I. Sensor Inputs**

1. Controller shall have the following built-in sensor inputs: 3 x Klik™ sensors: User-selectable, normally closed or normally open, dry contact switch closures for rain shutdown or switching purposes; 1 x Solar Sync™ weather sensor for automatic



water savings with rain and freeze shutdown; 3 x Flow Inputs: Compatible with Hunter HFS Flow-Sync™, and many other pulse type sensors.

2. A programmable rain delay shall allow the user to specify a number of days for the controller to remain shut down after restoration of a sensor alarm, such as a rain event.

**J. Pump/Master Valve**

1. The controller shall have 3 built-in P/MV outputs with a capacity of up to .800 mA each
2. The controller shall permit expansion to 6 P/MV outputs by allocating specified station outputs as “soft” P/MVs. The designated stations will then function exclusively as P/MV outputs 4, 5, and/or 6.
3. P/MV outputs may function as either normally-closed or normally-open
4. Basic P/MV activation is performed at the station level. Each station may have its own combination of P/MV activations
5. Additional P/MV activation shall be optionally programmable at the controller, water source, and flow zone level
6. The controller must be able to manage a normally-open P/MV at the water source level, upstream from and independently of one or more P/MVs at the flow zone level, as an example.

**K. Common Wire**

1. The controller shall have a minimum of 3 common wire terminals to facilitate connection of a large number of stations.

**L. Power Switch**

1. Transformer assembly must include an integrated UL-listed power switch to provide safe operating conditions inside the wiring compartment.

**M. Programming**

1. The controller shall have 32 independent programs with unique day schedules, start times, and station run times
2. Each program shall allow Day of Week, Interval, or Odd/Even schedule types
3. Each program shall offer up to 10 start times
4. Each program may be allowed to overlap, stack, or SmartStack™ to a user specified maximum number of simultaneous programs

5. Each program may have programmable Non-Water Windows, during which automatic irrigation will not be allowed
6. Each station shall be programmable in hours, minutes, and seconds of run time, from 1 second to 12 hours
7. The controller shall allow the creation of up to 64 "Blocks" of up to 8 stations each, used to facilitate programming and operation of larger systems
8. Each program may be assigned a programmable delay between stations, to allow for slow-closing valves or pressure recharging
9. Each station or block may be assigned Cycle and Soak settings to prevent runoff and waste by dividing run times into absorbable increments

**N. Operating System**

1. The controller display shall offer Copy and Paste functions for data entry tasks (such as run times, cycle and soak, program day schedules, Flow Zone and PMV assignments, etc).
2. A graphical display shall graph the start times and durations of each program over time, to allow the user to see the relationship between overlapping programs
3. The controller shall have Seasonal Adjust settings in 1% to 300% increments. Seasonal Adjust may be set by program in any of the following ways: Controller Level (adjusts all programs for ease of use); Program Level (adjustment by individual program); Monthly (pre-programmed adjustment for each month of the year); Solar Sync™ (automatic daily adjustment from an external sensor)
4. The controller shall have true Calendar Date Off programming, allowing specific dates to be skipped at any time of year, by program. Off dates may be recurring, or one-time occurrences
5. The controller shall provide a User Management function to limit access to programming and other operations, with unique passwords for multiple users, permitting either full or partial access to controller functions: User logins and activities shall be tracked by user ID, if password security is enabled; The controller shall automatically log users out after a period of inactivity.
6. The controller shall log all incidents and activity, organized into the following: Alarm Logs shall include the last 250 alarm events with date/time stamp to the second; Controller Logs shall include the last 250 controller events; Station Logs shall include the last 1500 recorded irrigation events of all types; All logs shall appear in the selected language of the controller.
7. Flow Operations: Controller shall feature independent flow management and flow monitoring in each of up to 6 flow zones; Controller shall allow flow budgeting at flow zone and mainline levels to monitor total monthly water usage, and provide an alarm when the budgeted amount is exceeded.

8. **I. Flow management shall allow the controller to schedule simultaneous stations on within each flow zone, based on their flow characteristics, to reach a user programmable rate of flow for the duration of the water window: Station flows may be “learned” via flow sensor, or entered manually by the user; Individual stations may be prioritized to insure they water earliest in flow management scenarios; Flow zone assignments shall be by individual station, so that multiple programs may operate their stations in a flow managed state within a given flow zone.**
9. **Flow monitoring uses a flow sensor to monitor actual flow, and intervene when high or low flow conditions are detected: Controller shall allow the station flows to be learned and entered automatically; The station flow values shall be adjustable for high and low flow alarm limits; The station flow alarm settings shall have an adjustable delay factor to allow flow to stabilize; Each flow zone shall have an absolute high flow limit, independent of the station level flow monitoring; Each flow zone shall allow Unscheduled Flow allowances to permit manual watering within user programmable limits; Each flow zone shall include adjustable recovery settings for high level flow alarms, allowing irrigation to be automatically allowed after an elapsed period of time, or manually only, requiring a user to visit and clear the alarm.**
10. **Flow operations shall also include the ability to assign a separate flow sensor and master valve to the mainline level, above the independent flow zones, to monitor and protect long runs of mainline pipe: Flow monitoring at the mainline level shall allow faster reaction to high or unexpected flow conditions, without the delay of station level diagnostics; Mainline protection may have its own monthly water budget, high flow and unscheduled flow limits, separately from lower level flow zone assignments.**
11. **The controller shall permit the creation of Conditional Response statements, permitting sensor inputs or other conditions to trigger pre-programmed actions on the part of the controller: A Conditional Response may allow a sensor input to start a station, block, or program; The response shall be configured to either pause all other irrigation and execute the response immediately, or to execute the response together with other flow managed activities; A Conditional Response may be configured to activate an external Status Output Station to provide a visual notification that the controller is in an alarmed state; A Conditional Response may be configured to switch from one water source (P/MV) to another based on the status of an external sensor switch.**

**O. Wireless Weather Sensor**

1. **The Sensor shall be mounted within 200 ft./60m of the irrigation controller. The Solar Sync Sensor shall include individual sensors for solar radiation, and air temperature, and shall also include a rain sensor. The rain sensor shall be capable of interrupting the power from the irrigation controller to the valves when rainfall exceeds a pre-selected amount.**
2. **The sensor circuitry shall utilize 2 sets of hygroscopic disks to activate switches in the unit. One switch will be for the total rainfall compensation unit and the other for the Quick Response unit. The Quick Response unit will turn off the irrigation system within 5 minutes of the onset of precipitation, depending on the intensity.**

3. The sensor shall be adjustable by turning a plastic collar on the device that regulates an opening, thus varying the rate of evaporation from the disks.
4. In addition, the built-in temperature sensor shall be capable of interrupting the power from the irrigation controller to the valves when ambient air temperature falls below 37 degrees Fahrenheit (3 degrees Centigrade).
5. All sensors shall be integrated into a single array, and shall be housed in an UV and corrosion resistant plastic casing.
6. The sensor shall have an integral, adjustable, aluminum, mounting bracket that allows installation on angled, as well as perpendicular surfaces. The sensor shall have a mounting option that allows for installation on a rain gutter.

**P. Impeller-Type Sensor with Tee**

1. The sensor unit shall be wired to the interface panel and shall be housed in a PVC sensor body. The sensor bodies shall be available in 1.5-inch Schedule 80 PVC.
2. The sensor shall be of a magnetic impeller-type design. The sensor circuitry shall be housed in a corrosion resistant plastic casing, completely sealed, and waterproof.

**2.25 VALVE BOXES**

- A. Valve boxes unless otherwise noted shall be fabricated from a durable plastic material resistant to weather, sunlight and chemical action of soils. They shall be green in color. The cover shall be secured with a stainless steel bolt mechanism. The cover shall be capable of sustaining a load of 1500 PSI. Valve box extensions shall be by the same manufacturer as the valve box. All valve boxes shall be as manufactured by Brooks, Carson or an approved equal
- B. Quick coupling valve boxes shall be round. The cover shall be heat branded with the letters "QCV," 2" high.
- C. Gate valve boxes shall be round. The cover shall be heat branded with the letters "GV," 2" high.
- D. Remote control valves shall be 12" X 18". The cover shall be heat branded with the letters "RCV" and the valve number in characters 2" high.
- E. Splice boxes shall be 12" X 18". The cover shall be heat branded with the letters "SB," 2" high.
- F. Traffic area boxes: concrete cast iron lid designed for vehicular traffic use.

**2.26 [ADDENDUM 4] TREE ROOT WATERING SYSTEM**

- ~~A.~~ [Addendum 4] The RWS is the smart watering product line designed to maximize tree and shrub transplanting survivability. It consists of a perforated polyethylene cylinder in a 36" length and a width of 4". The rigid mesh material helps support the horizontal movement of water and air into the root zone and adjacent soil. The cylinder supports pea gravel fill to provide better top-to-bottom water dispersion and firmness against root compression.

~~The Root Zone Watering System shall be pre-assembled, and constructed of a plastic mesh tube with a removable, perforated end cap. It shall have an internal baffle system to aid in dispersing the water throughout the root zone. When specified with an integral bubbler, it shall be attached to a pre-fabricated 1/2-inch, male threaded swing joint. The bubbler options shall be a 0.25 GPM pressure compensating bubbler. A filter fabric sleeve shall be available for field installation, for use in sandy soil conditions. The system shall either be 10-inch or 36-inch in height and provided with an adjustable check valve as indicated on plans. Manufacturer: Subject to compliance with requirements, provide product by Hunter Industries Incorporated. Model as indicated on drawings or as approved equal.~~

- B. [Addendum 4] The RWS is designed with an integrated bubbler and optional check valve. The water being emitted from the bubbler helps train roots away from surfaces and hardscapes, minimize surface erosion and reduce waste due to run-off. The factory-assembled RWS comes preconfigured with swing assemblies and/or spiral barbed fittings in order to promote irrigation design flexibility, accommodate all tree and shrub sizes, and help save installation time by being ready to install out of the box. The assemblies and fittings enable the RWS to be directly connected to PVC or polyethylene lateral lines. ~~On-Grade bubblers shall be pressure compensating and shall have a full circle discharge rate noted on plans at PSI noted on the plans. The bubbler shall be constructed of corrosion and UV-resistant plastic, with an integral elastomeric flow bushing for maintaining a constant flow rate over the operating pressure range of 20 to 90 PSI. The bubbler shall be compatible with a plastic filter screen to protect the nozzle from debris in the water. The PCB version shall have a 1/2-inch Female National Pipe Thread (FNPT) inlet for connection to a 1/2-inch male threaded riser. The nozzle shall carry a two-year, exchange warranty (not prorated). Bubbler shall be plumb to IPS flexible pvc pipe. Manufacturer: Subject to compliance with requirements, provide product by Hunter Industries Incorporated. Model as indicated on drawings or as approved equal.~~
- C. [Addendum 4] The RWS supports an extra-wide molded collar to provide convenient access to the bubbler and drip line fastener. It supports a locking grate cover to help deter vandalism. The RWS is designed with a peripheral watering feature which allows water to flow along the perforated cylinder resulting in the wetting of soil along the vertical distance of the cylinder.

2.27 SHRUB BUBBLERS:

- A. Pop-Up Sprinkler Body:
1. The sprinkler shall be available with a 12-inch pop-up stroke, depending on the body specified, to bring the nozzle into a clean environment. The sprinkler shall be available as an aboveground shrub head. The sprinkler shall have the option of either a factory-installed or field-installed drain check valve capable of checking up to 7 feet in elevation change. Sprinkler shall have the words "CHECK VALVE" stamped in white lettering on the body cap. The sprinkler shall have available an optional, snap-on cap, molded in purple alcryn rubber, or a replacement body cap, molded in purple to indicate the use of reclaimed water.
  2. The body of the sprinkler shall be constructed of corrosion and UV-resistant, heavy-duty A.B.S. The riser of the sprinkler shall be constructed of abrasion and UV-resistant A.B.S. and shall be adjustable for pattern alignment. The riser shall be compatible with female

threaded nozzles and shall have a stainless steel spring for positive retraction when irrigation is complete.

3. The sprinkler shall have a pressure-activated, multi-function, UV stable wiper seal that will clean debris from the pop-up stem while it retracts. The seal shall be molded around a rigid plastic ring to prevent seal deformation. This seal shall prevent the sprinkler from sticking in the up position and be capable of sealing the sprinkler riser stem to the sprinkler cap under normal operating pressures. The seal shall be removable from the cap for easy service and shall be replaceable.
4. The sprinkler shall have a factory-installed, removable flush cap with a pull-up tab that shall prevent debris from entering the sprinkler during installation and allow the system to be flushed before installing the nozzle. The flush cap shall have a directional flushing action that allows the water to escape only in one direction. The flush cap shall open as the stem extends and completely close when the stem is in the retracted position.
5. The sprinkler shall have an exposed surface diameter after installation of 2-1/4 inches. When specified with a factory-installed check valve, the 12-inch sprinklers will be supplied without the side inlet.

**B. [Addendum 4] ~~Pop-Up Sprinkler Body~~ Bubbler Nozzle :**

1. The pressure compensating bubbler shall have a full circle discharge rate at the GPM noted on the plans. The bubbler shall be constructed of corrosion and UV-resistant plastic, with an integral elastomeric flow bushing for maintaining a constant flow rate over the operating pressure range of 20 to 90 PSI.
2. The bubbler shall be compatible with a plastic filter screen to protect the nozzle from debris in the water. The PCB version shall have a 1/2-inch Female National Pipe Thread (FNPT) inlet for connection to a 1/2-inch male threaded riser. The PCN version shall have standard female threads that are compatible with the threaded riser on Hunter spray heads as well as some other manufacturer's spray heads

**2.28 TURF SPRINKLERS (NOZZLES):**

- A. The sprinkler shall be of the viscous fluid brake rotary type and be a multi-stream, multi-trajectory rotating stream sprinkler.
- B. In full or part circle model the sprinkler shall be capable of covering the foot radius at the psi pressure indicated on the drawings with an equivalent full circle discharge rate indicated on the drawings.
- C. Sprinkler Assembly models shall produce and maintain a matched precipitation rate no greater than 0.6" per hour throughout the arc adjustment range and radius adjustment range, (up to 25% of radius reduction), when spaced at 50% of wetted diameter. Sprinkler Assembly short radius mode shall produce and maintain a matched precipitation rate no greater than 1.0" per hour throughout the arc adjustment range and radius adjustment range, (up to 25% of radius reduction), when spaced at 50% of wetted diameter.
- D. The part circle sprinkler shall have an infinitely adjustable arc from 45° to 105°, 90° to 210° or between 210° to 270° depending on the model selected. The full circle sprinkler shall irrigate a

full 360°. The 45° to 105° model shall not require coverage from adjacent sprinklers closer than 3' from the head.

- E. Full or part circle sprinklers shall be capable of up to 25% radius reduction using a stainless steel radius adjustment screw. The radius reduction screw shall have a slip clutch mechanism to prevent internal damage if turned past the minimum or maximum radius settings. The radius reduction screw shall reduce the pressure and flow upstream of the adjustable orifice thereby maintaining stream integrity.
- F. Part circle sprinklers shall have arc adjustment capabilities using a stainless steel ring. The adjustment ring shall be effective only while the sprinkler is popped up and shall be ineffective while the sprinkler is popped down. When turned past the minimum or maximum arc limits the adjustment mechanism shall have a ratcheting action to prevent internal damage.
- G. This same ratcheting action shall allow the orientation of the left edge of the variable arc when installed on a fixed riser or in a popup body. This is independent of and in addition to any ratchet that may exist in a popup body.
- H. The sprinkler itself shall pop-up at approximately 15 psi of water pressure. Upon cessation of water pressure, the sprinkler itself shall retract. When installed in a pop-up body the sprinkler itself shall pop-up after the body stem is almost fully extended. Upon decreasing pressure the sprinkler itself shall pop-down before the pop-down of the body stem is complete.
- I. The sprinklers adjustable orifice shall be manufactured from polyurethane and acetyl plastic materials for durability.
- J. The sprinkler shall be fitted with a detachable filter.
- K. Sprinkler Assembly models shall be able to be installed in popup bodies having a 5/8-27 UNS male threaded stem, at all common popup heights.
- L. Manufacturer: Subject to compliance with requirements, provide product by Hunter Industries Incorporated. Model as indicated on drawings or as approved equal

2.29 TURF SPRINKLERS ([**ADDENDUM 4**] ~~30~~ **40** PSI REGULATED POP-UP BODY):

- A. The sprinkler shall be available with 6-inch pop-up stroke to bring the nozzle into a clean environment. The sprinkler shall be available as an aboveground shrub head. The sprinkler shall have a factory-installed check valve capable of checking up to 10 feet in elevation change. When specified as factory-installed, the sprinkler shall have the words "CHECK VALVE" stamped in white lettering on the body cap.
- B. The sprinkler shall have a standard pressure-regulating device as an integral part of the pop-up riser. This regulator will prevent fogging or misting of the nozzle spray pattern by maintaining a constant nozzle outlet pressure of [**Addendum 4**] ~~30~~ **40** PSI with inlet pressures of up to 100 PSI, regardless of the nozzle installed.
- C. The body of the sprinkler shall be constructed of corrosion and UV-resistant, heavy-duty A.B.S. The riser of the sprinkler shall be constructed of abrasion and UV-resistant A.B.S. and shall be adjustable for pattern alignment. The riser shall be compatible with female threaded nozzles and shall have a stainless steel spring for positive retraction when irrigation is complete.

- D. The sprinkler shall have a pressure-activated, multi-function, UV stable wiper seal that will clean debris from the pop-up stem while it retracts. The seal shall be molded around a rigid plastic ring to prevent seal deformation. This seal shall prevent the sprinkler from sticking in the up position and be capable of sealing the sprinkler riser stem to the sprinkler cap under normal operating pressures. The seal shall be removable from the cap for easy service and shall be replaceable.
- E. The sprinkler shall have a factory-installed, removable flush cap with a pull-up tab that shall prevent debris from entering the sprinkler during installation and allow the system to be flushed before installing the nozzle. The flush cap shall have a directional flushing action that allows the water to escape only in one direction. The flush cap shall open as the stem extends and completely close when the stem is in the retracted position.
- F. The sprinkler shall have an exposed surface diameter after installation of 2-1/4 inches. In addition, the 6-inch and 12-inch sprinklers shall be available with a 1/2-inch FNPT side inlet. When specified with a factory-installed check valve, the 6-inch and 12-inch sprinklers will be supplied without the side inlet.
- G. The sprinkler shall carry a five-year, exchange warranty (not prorated).
- H. Manufacturer: Subject to compliance with requirements, provide product by Hunter Industries Incorporated. Model as indicated on drawings or as approved equal.

2.30 MANUAL FLUSH VALVE:

- A. Manual flush valve shall be a ball valves 2 inches or smaller and shall be produced of shall be produced of PVC Type I, cell classification 12454. End connectors shall be thread type.
- B. Valve body shall have two stem stops. Valve carrier shall have a full block polymeric locking strip. Valve seats shall be produced of Teflon® material.
- C. Valve stem shall have two o-rings
- D. Valve O-rings shall be made of EPDM.
- E. Valves shall be operated by a handle or pneumatically or electrically by an actuator. 1/2 through 4" valves shall be full port (equal to or greater than the minimum inside diameter of Sch 80 pipe).
- F. Valves shall be capable of being adjusted externally for seat wear.
- G. All ball valves shall have a minimum working pressure of not less than 150 PSI and shall conform to AWWA standards. Valves shall meet or exceed ASTM's standard F-1970 for pressure rating.
- H. Ball valves shall be manufactured by Nibco or approved equal.

2.31 DRIP SYSTEM OPERATION INDICATOR KIT

- A. Drip system operation indicator shall be 6-inch pop-up with no flow nozzle. Pop-up shall be manufactured by Rain Bird or approved equal.



2.32 DRIPLINE

- A. [Addendum 4] Dripline at Stormwater Planters: The Hunter Eco-Wrap shall be pre-assembled and constructed with a wrapping of special polypropylene fleece material and pressure-compensating, non-draining inline emitter tubing. The wrapped emitter tubing shall have a nominal outside diameter of 17mm and shall have 0.6 GPH (2,3 l/h) emitters. Emitters shall be uniformly spaced at 12 in (30 cm) intervals. Tubing shall be constructed to landscape grade specifications with a nominal wall thickness not less than 1.1mm and a UV protection rating of seven years. Each roll of Eco-Wrap shall be 250 ft (76m) in length. The rolls shall be delivered with solid caps inserted to protect the tubing from debris during installation. The Eco-Wrap subsurface irrigation system shall be manufactured for Hunter Industries Incorporated, San Marcos, California.
- B. [Addendum 4] Dripline at Non-Stormwater Planters: The inline emitter shall be welded to the inner circumference of the polyethylene tubing. The inline emitter shall have dual outlet ports, 180° apart, ensuring only one port has contact with the ground when the tubing is installed at grade and mulched over. DRIP LINE (PLD) emitter shall pressure compensate by lengthening the emitter's turbulent flow path. The emitter shall be cylindrical in shape and provide surface area for filtration throughout 360° of its outer circumference. This increased filtration surface area shall assure that the water that enters the inline emitter can always come from the upper half, or cleanest part of the flow path in the polyethylene tubing regardless of how the inline tubing lays on the ground. Drip tubing shall be brown in color and conform to a Nominal .5575" Inside Diameter, Nominal .045" Wall Thickness and shall be compatible with all industry standard 17MM fittings (Both barbed and compression) Drip tubing shall have factory installed, check valve and pressure-compensating, inline emitters with spacing as indicated on drawings. When specified the tubing shall be supplied without any emission devices inserted (PLDBLNK). The flow rate from each installed inline emitter shall be a consistent 0.6 gallons per hour (1.35, 2.35, or 3.75 liters per hour [LPH] )or when inlet pressure is between 15 and 50 psi (1.0 to 3.5 bar). OPERATIONAL PRESSURE RANGE OF 15-50PSI (1.0-3.5 bar)
- A. ~~[Addendum 4] Dripline shall be a continuous self-cleaning, recycled content, pressure compensating dripline with built-in check valve and be Cupron® copper oxide infused for root intrusion deterrent. The low volume dripline shall have an integral and evenly spaced pressure compensating check valve emitters welded to the inside of the tubing that is made with recycled content. Dripline shall be available with emitters discharge and be evenly spaced at the on-center spacing indicated on drawing.~~
- B. ~~[Addendum 4] Dripline shall be nominally sized to 17mm (½") low-density linear polyethylene tubing made with recycled content qualifying for maximum LEED credits. Dripline shall be constructed with pressure compensation, continuously self-cleaning, integral emitters with an internal check valve with root intrusion component at these spacings (12", 18", or 24" centers). Dripline shall also be manufactured without emitters installed. The exterior of the tubing shall be Dark brown in color and conform to an outside diameter (O.D.) of 0.66 inches and an inside diameter (I.D.) of 0.56 inches and be laser etched on the exterior wall with manufacturer, product ID, flow rate of emitter and on-center spacing of emitters and date code. Individual pressure compensating emitters shall be welded to the inside wall of the tubing as an integral part of the manufacturing process. These emitters shall be constructed of a two (2) piece plastic emitter housing containing a continuously self-flushing molded silicone diaphragm. The emitter shall have~~

~~a built-in check valve that will hold back an 8.5' column of water. The emitter shall be installed into the tubing so that the inlet to the emitter is toward the center of the tubing cross section. The emitter shall also have a built-in physical root barrier whereby the water shall exit the emitter from one location and shall exit the tubing from a second location. This physical barrier shall create an air gap inside the exit bath of the emitter. The emitter shall have the upper half constructed with a root deterrent material Cupron® copper oxide which during the manufacturing process is mixed with the emitter resin material infusing the copper oxide in the emitter. It will not wash off, wear off or leach out of the emitter.~~

- ~~C. [Addendum 4] Each emitter shall have the ability to independently regulate discharge rates, with an inlet pressure range of 21.8–58 pounds per square inch (psi), at a constant flow and with a manufacturer's coefficient of variability of 0.03 or less. Recommended operating pressure shall be between 21.8–58 psi. The emitter discharge rate shall be 0.33, 0.53, 0.77, or 1.16 gallons per hour (GPH) utilizing a combination of turbulent flow and reduced pressure compensation by molded silicone diaphragm. The emitters shall be capable of continuously cleaning themselves while in operation and have an anti-siphon feature which prevents debris from entering outlet at system shutdown. The dripline shall be available with 12", 18", and 24" spacing between emitters unless otherwise specified. Maximum system pressure shall be 58 psi for maximum fitting integrity. Filtration shall be 120 mesh or finer. Bending radius shall not be smaller than 7" or tubing kinking may result.~~

2.33 ELECTRICAL REQUIREMENTS TO AUTOMATIC CONTROLLERS (120V)

- A. Service to automatic controllers and final hook up shall be provided by electrical subcontractor.
- B. Electrical equipment installed outside building shall be NEMA 4 type.
- C. All connections between electrical services and equipment shall be in rigid galvanized electrical conduit, with conduit and wiring size as required.
- D. To be complete in every respect to City Electrical Code, ready for use and in accordance with manufacturer's requirements. Provide separate power shut-off switch at panel for each controller. All wiring in galvanized conduit and fittings from source provided under the electrical section. No running threads accepted; use nipples. Conduit system shall be 660-volt insulation, NEC standard annealed copper wire and shall be minimum AWG #12 TW or RW. Protect each controller by a code approved ground connection. Supply to be 120 volts, 60 cycle, single phase, one amp. Use only galvanized steel fasteners in securing controllers in position. Install new controller as detailed on drawings.

2.34 REMOTE CONTROL VALVE IDENTIFICATION TAGS

- A. 2-1/4 by 2-3/4-inch yellow polyurethane with valve number embossed on tag, as manufactured by Christy's Irrigation I.D. Tags, (714) 771-4142, or equal.

2.35 OTHER COMPONENTS

- A. Tools and Spare Parts: Furnish operating keys, servicing tools, test equipment, spare parts and other items indicated in drawings and specifications.
  - 1. Other Materials: Provide other materials or equipment shown on drawings or installation details that are part of irrigation system, even though items may not have been referenced in specifications.

PART 3 - EXECUTION

3.1 GENERAL

- A. All work shall be performed by competent, experienced workmen and in a manner to coincide with methods as set forth by the manufacturers of the equipment to be used and as acceptable to the Owner's Representative. No consideration will be given to any design changes unless called for by the Owner's Representative.
- B. Contractor shall be responsible for damages caused during his operations to any existing underground utility lines including existing irrigation control wires, storm sewers, sanitary sewer systems, gas lines, potable water lines, irrigation lines, telephone cables, gasoline or oil lines, electrical cables, or any other systems (buried or overhead). If such damage should occur, Contractor shall immediately notify Landscape Architect, Owner, and department affected by such damages and shall pay all ensuing costs.

- C. Where it is necessary to excavate adjacent to existing trees, use all possible care to avoid injury to trees and tree roots. Excavation in areas where 2 inches and larger roots occur shall be done by hand. Roots 2 inches and larger in diameter, except directly in the path of pipe or conduit, shall be tunneled under and shall be heavily wrapped in burlap, to prevent scarring or excessive drying. Where a ditching machine is run close to trees having roots smaller than 2 inches in diameter, the wall of the trench adjacent to the tree shall be hand trimmed, making clean cuts through. Roots 1 inch and larger in diameter shall be painted with two coats of Tree Seal, or equal. Trenches adjacent to trees would be closed within 24 hours. Where this is not possible, the side of the trench adjacent to the tree shall be kept shaded with burlap or canvas.
- D. Comply with all governing construction and plumbing ordinances for all work under this contract.
- E. All work shall be assembled to conform to details and notes on the drawings, whether or not mentioned in the specifications.

### 3.2 EXAMINATION

- A. Examine site conditions for compliance with requirements and conditions affecting installation and performance prior to commencement of work. Note the extent and type of work to be done and field – verify quantity, location and condition of all existing improvements to remain and all new improvements. Should there be discrepancies between the contract documents and the actual site conditions, do not proceed with the installation without notifying the Owner's Representative. Proceeding without notification, the Contractor assumes full responsibility for all revisions and related costs
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.3 PREPARATION

- A. Exercise care in excavation and working near existing utilities. Check existing utility locations. Contractor shall be responsible for damages to utilities which are caused by his operations or neglect.
- B. Coordinate installation of the sprinkler irrigation materials, including pipe, so there shall be no interference with the utilities or other construction or difficulty in planting trees, shrubs and ground covers.
- C. Do not proceed with work until unacceptable site conditions are corrected or existing utilities are located and/or marked out in field.
- D. Protection:
  - 1. Provide barricades, coverings, warning signs, lights and other protection required by local code or OSHA to prevent damage to existing improvements to remain and protect the public.
  - 2. Protect improvements on adjoining areas as well as those on the project site.
  - 3. Restore any improvements damaged by this work to original condition, as acceptable to Owner's Representative or other parties or authorities having jurisdiction.

4. Protect existing trees and other vegetation to remain against damage. Do not stockpile construction or excavated materials within drip lines.

### 3.4 INSPECTIONS AND REVIEWS

- A. Subsections of mainline pipe may be tested independently, subject to review of Irrigation Engineer.
- B. Provide clean, clear water, pumps, labor, fittings, and equipment necessary to conduct tests or retests.
- C. Site Inspections:
  1. Before any work commences, a conference shall be held with the Owner's Representative and Contractor regarding general requirements of this work.
  2. Prior to trenching, Contractor shall be responsible for verifying existing pressure at point of connection. If pressure varies from what is indicated on drawings, the Contractor shall immediately notify Owner's representative.
  3. Contractor's responsibility:
    - a. Examine surfaces for conditions that will adversely affect execution, permanence and quality of work.
    - b. Verify that grading has been completed and the work of this section can properly proceed.
    - c. Exercise extreme care in excavating and working near existing utilities. Contractor is responsible for damages to utilities which are caused by his operations or neglect. Check existing utility drawings for locations.
    - d. Notify the Owner's Representative in writing, describing unacceptable conditions.
    - e. Do not proceed with work until unacceptable site conditions are corrected or existing utilities are located.
  4. Commencement of work implies acceptance of existing site conditions.
- D. Verification of Dimensions
  1. Verify all horizontal and vertical site dimensions prior to staking of heads. Do not exceed spacing shown on drawings for any given area. If such modified spacings demand additional or less materials than shown on the drawings, notify Architect before commencing work.
- E. Utility Locates ("Call Before You Dig"):
  1. Arrange and coordinate Utility Locates with local authorities prior to construction.
  2. Repair underground utilities that are damaged during construction. Make repairs at no additional cost to contract price.
- F. The Contractor shall request the presence of the Owner's Representative at least 48 hours (two working days) in advance of testing.
- G. All hydrostatic tests shall be made only in the presence of the Owner's Representative. No pipe shall be backfilled until it has been inspected, tested and approved.

- H. Contractor to furnish necessary force pump and all other test equipment.
- I. Testing shall be performed after installation of all equipment or as noted below, but prior to the installation of plant material. No planting shall take place until coverage test has been approved in writing by the Owner's Representative. Tree planting may commence upon approval from Owner's Representative.
- J. Failure of initial testing review will require additional review. Payment of costs, including travel expenses and site visits by Owner's Representative, for additional reviews that may be required due to non-compliance with the Construction Documents will be Contractor's responsibility.
- K. Site inspections and notification time:
  - 1. Pre-construction conference 7 days
  - 2. Pressure line installation and testing 48 hours
  - 3. Controller installation 48 hours
  - 4. Lateral line and drip emission device installation 48 hours
  - 5. Coverage test 48 hours
  - 6. Monthly maintenance walk 48 hours
  - 7. Final inspection 7 days
- L. No field inspections will commence unless record drawings are current and available for observation upon request by the Owner's Representative.
- M. Mainline pipe may be subjected to pressure test at any time after partial completion of backfill. Allow irrigation pipe jointed with solvent-welded PVC joints to cure at least 24 hours before testing.
- N. Provide clean, clear water, pumps, labor, fittings, and equipment necessary to conduct tests or retests.
- O. Hydrostatic Pressure Test:
  - 1. Subject mainline pipe (3-inch and smaller) to hydrostatic pressure equal to 140 PSI for two hours. Test with mainline components installed.
  - 2. Center-load pipe with approved backfill to anchor pipe before testing to prevent pipe from moving under pressure. Do not cover couplings and fittings.
  - 3. Purge air from mainline pipe before test. Attach pressure gauge to mainline pipe in test section.
  - 4. Observe pressure loss on pressure gauge. If pressure loss is greater than 5 PSI, identify reason for pressure loss. Replace defective pipe, fitting, joint, valve, or appurtenance. Repeat test until pressure loss is equal to or less than 5 PSI.
  - 5. Visually inspect irrigation pipe for leakage and replace defective pipe, fitting, joint, valve, or appurtenance. Repeat test until pipe passes test.
  - 6. Cement or caulking to seal leaks is prohibited.
- P. Pressure Line Observation:

1. Prior to any backfilling of any trench(s) Contractor shall call for field observation for verification of material, depths, clearances, and tracer wire by the Owner's Representative.
2. Any trenching covered that was not inspected or approved shall be made visible for observation at the cost of the Contractor.

Q. Lateral Line Testing:

1. Prior to backfilling of any trench(s) Contractor shall call for field observation for verification of material, depths and clearances by the Owner's Representative.
2. All deep root watering systems and assemblies shall be made visible for observation for verification that all material has been installed per plans and specifications.
3. All drip lines and assemblies shall be made visible for observation for verification that all material has been installed per plans and specifications.
4. Any trenching covered that was not inspected or approved shall be made visible for observation at the cost of the Contractor.

R. Operational and Coverage Test:

1. Activate each remote-control valve in sequence from controller. Provide either one additional personal with radio or use handheld remote to activate remote control valves from controller. Manually activating remote control valve using manual bleed mechanism at remote control valve is not an acceptable method of activation. Owner's Representative will visually observe operation, water application patterns, and leakage. All irrigation deep root watering systems and drip systems must provide adequate coverage. Any areas not receiving adequate coverage shall be corrected and retested per the Owner's Representative.
2. Replace defective remote-control valve, solenoid, wiring, or appurtenance to correct operational deficiencies.
3. Replace, adjust, or move water emission devices to correct operational or coverage deficiencies.
4. Replace defective pipe, fitting, joint, valve, bubbler, or appurtenance to correct leakage problems. Cement or caulking to seal leaks is prohibited.
5. Repeat test(s) until each lateral passes all tests. Repeat tests, replace components, and correct deficiencies at no additional cost to Owner.
6. All distribution emission devices must be adjusted to prevent over surface runoff of water outside of landscape areas. (See adjusting the system section).

S. Communication and Sensor Cable:

1. Test for leaks to ground per manufacturer's recommendations. Test results must meet or exceed manufacturer's guidelines for acceptance.
2. Test cable for continuity if cable is being installed for future expansion of the irrigation system.
3. Replace defective wire, underground splices, or appurtenances. Repeat test until manufacturer's guidelines are met.

T. Automatic Irrigation Control System Grounding:

1. Test for proper grounding of control system per manufacturer's recommendations. Test results must meet or exceed manufacturer's guidelines for acceptance.

2. Automatic Irrigation Control System shall be grounded and conform to requirements of the National Electric Code, current edition as adopted by local code, and the manufacturer's specifications. No solder connections will be allowed. Resistance to ground shall be no more than 25 ohms.
3. Test to verify proper grounding.
4. Replace defective wire, grounding rods, grounding plates, or appurtenances. Repeat test until manufacturer's guidelines are met.

U. Tracing Wire Test:

1. Pass current through wire and demonstrate that wire is capable of locating the pipe.
2. If wire will not pass current, locate break and test until tracing wire works in accordance with its intended use.

V. Final Irrigation Inspection:

1. All irrigation systems shall be tested in the presence of the Owner's Representative and under complete automatic operation and proven to be leak free, irrigating designated areas per plans and specifications with least amount of over spray as possible.
2. Contractor shall provide as-built record drawings and controller charts at final irrigation inspection for approval prior to Mylar transfer and laminating.
3. All irrigation turn over items shall be turned in to the Owner's Representative prior to the start of maintenance.

W. Field Mock Up:

1. Fabricate an on-site example of the following assemblies for demonstration prior to construction. The mock-ups must be presented to the Owner's Representative and meet approval prior to construction.
  - a. Deep root water system and Drip Remote Control Valve Assembly: Mock-up is to include remote control valve, wire splices, filters, pressure regulators, and isolation ball valves.
  - b. Quick coupling valve assembly.
  - c. Deep root watering system assemblies.
  - d. Drip assemblies.

X. When the irrigation system is completed, perform a coverage test in the presence of the Owner's Representative to determine if the water coverage for planting areas is complete and adequate. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from plan, or where the system has been willfully installed as indicated on drawings when it is obviously inadequate, without bringing this to the attention of the Owner's Representative. This test shall be accomplished before any ground cover planting is planted.

1. Upon completion of each phase of work, the entire system shall be tested and adjusted to meet site requirements

3.5 WATER AUDIT

- A. Coordinate and provide a Landscape Irrigation Audit, to be performed by an independent Certified Landscape Irrigation Auditor, certified and in good standing with the Irrigation Association (IA), for all overhead-irrigated landscape areas. Arrange and pay for the services of



the Auditor under contract work. The Auditor shall be independent of the property Owner and of all contractors associated with the property. Conduct the audit in accordance with the current edition of the IA's Landscape Irrigation Auditor's Handbook. Provide the results of the audit to the Owner's Representative in a report format acceptable to the Landscape Architect, with the report signed by the Auditor. Provide copies of the report to the Landscape Architect and Contractor. Include the following information in the report: Controller identification letter designation and location, station sequence numbers and valve locations, sprinkler head location description and sprinkler spacing, water pressure reading at each valve or lateral, catch device readings and locations, calculated distribution uniformity for each valve, calculated precipitation rates for each valve, and a 12-month irrigation schedule (run times per cycle, cycles per day, and days per week for each valve).

- B. Compliance with this provision is required before the Owner will issue a Letter of Final Acceptance.

3.6 WATER SUPPLY:

- A. Sprinkler irrigation system shall be connected to water supply points of connection as indicated on the drawings.
- B. Connections shall be made at approximate locations shown on drawings. Contractor is responsible for minor changes caused by actual site conditions.

3.7 DRIP IRRIGATION LAYOUT:

- A. Contractor shall layout dripline, etc. for approval from City's Representative.
- B. Layout drip systems and make minor adjustments required due to differences between site and drawings. Where piping is shown on drawings under paved areas, but running parallel and adjacent to planted areas, install the piping in the planted areas.
- C. Check headers (manifolds) and dripline laterals for leaks before covering with soil.
- D. Check pressure at the site and be sure to operate below the maximum rated pressure of 60 PSI. Check and record pressure at the supply header and flush header. Any changes in pressure can be used in future troubleshooting.
- E. Be sure there is uniform soil compaction all over the site after installation.
- F. After installation, open the flush valves (one at a time) and collect some of the water to check to be sure that the installation is clean.
- G. After installation and backfill, observe the first wetting pattern. Rapid puddling could indicate a leak or might mean that the driplines are not buried at the specified depth.
- H. Allow for expansion and contraction of tubing.
- I. Tie-Down Stake:
  - 1. Stagger stakes every 3 feet in sand, 4 feet in loam, and 5 feet in clay.

2. At fittings where there is a change of direction such as tees or elbows, use tie-down stakes close to the fitting on each leg of the change of direction.
  3. Insertion plow and trenched installations do not require tie down stakes.
- J. Manual Line flush point:
1. Install the manual flush at a low point in the exhaust header of a grid layout, or at the mid-point of a Loop Layout.
  2. Install a flush port with a threaded plug or a manual flushing valve in a valve box with a gravel sump adequate to drain approximately one gallon of water.
  3. Manual flush points are normally installed as far away from the water source as possible.
- K. Dripline Insert Adapter (only allowed on 1-1/2" or larger PVC pipe)
1. Drill hole using 5/8" hole saw size. Use low speed drill. Remove burrs from hole.
  2. Remove shavings and place appropriate grommet firmly in hole with flange facing out.
  3. Push dripline Insert Adapter into grommet until flange and grommet are flush.
- L. Dripline Flushing:
1. After all dripline feeder lines and risers are in place and connected, all necessary diversion work has been completed, and prior to the installation of any dripline, the control valves shall be opened and a full head of water used to flush out the lines and fittings.
  2. Subsurface dripline shall be installed after flushing the system has been completed. Avoid contaminating dripline with debris.
  3. Subsurface dripline shall be flushed prior to the installation of all flush valves.
  4. Flush the system every two weeks for the first 6 weeks and check the water that is flushed out for cleanliness.
  5. Establish a regular flush schedule for the future after these initial checks.
  6. Flush the system well after any repairs are made.
  7. Check the pressure at the supply and flush headers on a regular basis and compare with the pressure readings taken right after installation.
  8. Flush the system every two weeks for the first six (6) weeks and check the water that is flushed out for cleanliness. Establish a regular system flushing schedule for the future based on results from the initial six-week flushing schedule.
- M. Winterization:
1. Winterizing an irrigation system involves removing enough water to ensure that components are not damaged due to freezing weather.
  2. Check the manufacturer's instructions for winterizing the valves, filters and backflow prevention devices.
  3. If compressed air is used to blowout the lines:
    - a. Compressed air may only be used with the flush valve open and with the air pressure at 40 psi or less.
    - b. Drip fittings are rated to 50 psi, so the air pressure must be adjusted below this pressure.
    - c. It is air volume, not pressure, which is effective when blowing out the lines.
    - d. The pressure-regulating valve that is part of the control zone regulates water, not air pressure.
    - e. With all drain ports open, compressed air should be applied until no water is seen exiting the ports.

- f. After turning off the air, close all drain ports.
- 4. If compressed air is not used to blowout the lines:
  - a. A drain port should be installed at all low points in the zone. These ports may be a tee or elbow with a threaded plug or a manual flush valve.
  - b. If the zone is in a grid or closed loop system, the headers may contain a significant amount of water because they are either blank tubing, PVC, or poly pipe. It is important to provide drain ports for these components.
  - c. If the zone has laterals that dead-end and are not connected to an exhaust header, the lateral ends should be opened to drain at the lowest point(s).

3.8 DIAGRAMMATIC INTENT:

- A. The drawings are essentially diagrammatic. The size and location of equipment and fixtures are drawn to scale where possible. Provide offsets in piping and changes in equipment locations as necessary to conform to structures and to avoid obstructions or conflicts with other work.

3.9 GRADES:

- A. Prior to commencing any work, the Contractor shall carefully check all grades and verify that after all irrigation work and soil preparation completed, all grades will be per specified depth as per the landscape Contractor's scope of work with a plus or minus of 1/10-inch. Grades around existing tree crowns to drain away from tree crown.

3.10 DISCREPANCIES:

- A. In the event of discrepancy, notify the Owner's Representative.
- B. Do not proceed with installation in areas of discrepancy until all discrepancies have been resolved.

3.11 FIELD MEASUREMENTS:

- A. Make all necessary measurements in the field to ensure precise fit of items in accordance with the original design. Contractor shall coordinate the installation of all irrigation materials with all other work.

3.12 TRENCHING

- A. Dig trenches straight and support pipe continuously on bottom of ditch. Lay pipe to an even grade. Trenching excavation shall follow layout indicated on drawings to the depths below finished grade and as noted. Where lines occur under paved area, these dimensions shall be considered below subgrade.
- B. Provide a minimum cover of 18 inches for all pressure supply lines.
- C. Provide a minimum of cover of 12 inches for all non-pressure lines.

- D. Provide a minimum cover of 18 inches for all cable wiring in conduit, and 24 inches for all direct burial cables.
- E. Provide a minimum cover of 24 inches between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under all paving. Sleeves as per specifications.
- F. Trenches located under areas where decomposed granite paving, asphaltic concrete paving, concrete paving, or concrete walks will be installed shall be backfilled with sand (a 6-inch layer below the pipe and 6-inch above the pipe) and compacted to equal the compaction of the existing adjacent undisturbed soil and shall be left in a firm unyielding condition. All trenches shall be left flush with the adjoining grade. The sprinkler irrigation Contractor shall set in place, cap and pressure test all piping under paving prior to beginning work.

### 3.13 BACKFILLING

- A. The trenches shall not be backfilled until all required tests are preformed. Trenches shall be carefully backfilled with the clean excavated materials approved by Owner's Representative for backfilling, consisting of earth, loam, sandy clay, sand or other approved materials, free from large clods of earth or stones.
- B. A fine granular material backfill will be initially placed on all lines. No foreign matter larger than ½ inch in size will be permitted in the initial backfill.
- C. Backfill shall be mechanically compacted in 4-inch layers under the pipe and uniformly on both sides for full width of the trench and full length of the pipe in landscape areas to a dry density equal to adjacent undisturbed soil in planting areas. Backfill will conform to adjacent grades without dips, sunken areas, humps or other surface irregularities. Materials shall be sufficiently damp to permit thorough compaction, free of voids.
  - 1. Backfill: Free of rocks over 2 inches, metal and trash.
  - 2. Sand bedding for pressured pipe: Not less than 6 inches below and above pipe. Note: Avoid introduction of dissimilar materials, which may result in a galvanic reaction.
- D. Flooding of trenches will be permitted only with the approval of Owner's Representative.
- E. If settling occurs and subsequent adjustments in pipe, valves, sprinkler heads, lawn planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to Owner.
- F. Jetting and settling of trenches is preferred.
- G. Under no circumstances shall truck wheels be used to compact soil.

### 3.14 PIPING

- A. General:
  - 1. Maintain a minimum horizontal distance of 3'-0" between control valves that are installed side by side.

2. Maintain a minimum 1'-6" distance between fittings installed in main line.
  3. Crossing fittings are not allowed.
- B. Generally, piping under existing walks is done by jacking, boring or hydraulic driving; where only cutting or breaking of sidewalks and/ or concrete is necessary, it shall be done and replaced by the Contractor as part of the contract cost. Permission to cut or break of sidewalks and/or concrete shall be obtained from the Owner's Representative. No hydraulic driving will be permitted under concrete paving or A.C. paving.
- C. Carefully inspect all pipe and fittings before installation, removing dirt, scale, and burrs and reaming; install pipe with all markings up for visual inspection and verification.
- D. Exercise care in handling, loading, unloading, and storing plastic pipe and fittings; store plastic pipe and fittings under cover until ready to install; transport plastic pipe on a vehicle with a bed long enough to allow the pipe to lay flat, avoid undue bending and any concentrated external load.
- E. Remove all dented and damaged pipe sections.
- F. Contractor shall install concrete thrust blocking at all changes of direction and terminal points of pressure pipe.
- G. All lines shall have a minimum clearance of 6 inches from each other and 12 inches from lines of other trades.
- H. Parallel lines shall not be installed directly over one another.
- I. In solvent welding, use only the specified primer and solvent cement and make all joints in strict accordance with the manufacturer's recommended methods; allow solvent welds at least 15 minutes setup time before moving or handling and 24 hours curing time before filling. 360-degree applicators shall be used to apply primer and solvent on sizes 2-1/2 inches and larger.
- J. Center-load pipe with approved backfill to anchor pipe before testing to prevent pipe from moving under pressure. Do not cover couplings and fittings.
- K. All threaded plastic-to-plastic connections shall be assembled using Teflon tape.
- L. For plastic-to-metal connections, work the metal connections first. Use a non-hardening pipe dope on all threaded plastic-to-metal connections, except where noted otherwise.
- 3.15 PIPE SLEEVING AND BORING
- A. All sleeving shall be 2 times the diameter of the pipe used. Sleeving for control wires shall be 2 inches in diameter minimum.
- B. All trenches for sleeving must be compacted to 95% compaction using manual or mechanical taping device.
- C. Contractor shall be responsible for the installation of all sleeves required for the irrigation system not listing in the drawings.

- D. Bore for sleeves under obstructions that cannot be removed. Employ equipment and methods designed for horizontal boring

**3.16 THRUST BLOCKS**

- A. Use thrust blocks for fittings on pipe greater than or equal to 3-inch diameter.
- B. Size, orient, and place cast-in-place concrete against undisturbed soil as shown on installation details.
- C. Wrap fitting or component with plastic to protect fitting from concrete. Do not bury fitting or component in concrete.
- D. Commercially delivered concrete requires a 3,000 PSI mix.
- E. If pre-mix bags are used, mix per manufacturer's recommendations (maximum 1 gallon of water to 80-pound bag of pre-mix).
- F. Contractor is responsible for performing a slump test (minimum of 2-inches to a maximum of 4-inches) if requested by Owner's Representative.

**3.17 QUICK COUPLER INSTALLATION**

- A. Install quick couplers per manufacturer's written recommendations.

**3.18 VALVES AND VALVE BOXES**

- A. Provide at all locations indicated. Install only one valve per box, minimum 6" clearance from bottom of valve to soil level. Valve must be fully enclosed within box allowing space for maximum opening of flow control.
- B. When grouped together allow at least 12 inches between valves.
- C. Fill area under box at each corner with supporting brick.
- D. All remote-control valves to be installed with SCH 80 threaded fittings, with ball valve and union. To be threaded from main.
- E. Contractor shall brand all valve boxes.

**3.19 AUTOMATIC CONTROLLER**

- A. Install as per manufacturer's instruction. Remote control valves shall be connected to controller in numerical sequence as shown on drawings.

**3.20 HIGH VOLTAGE WIRING FOR AUTOMATIC CONTROLLER**

- A. 120-volt power connection to the automatic controller from electrical source connection shown on electrical drawings shall be provided by Contractor.

- B. All electrical work shall conform to local codes and ordinances and shall be in accordance with the National Electrical Code, most recent edition.

**3.21 LOW VOLTAGE WIRING**

- A. Place wiring in the same trench and routing as pressure supply lines.
- B. Install wiring along side main line. Bundle and tape to side of main line at an interval of 10 – feet on center. Install wires in conduit from controller location to main line.
- C. When more than one wire is placed in a trench, tape wires together at maximum 10foot intervals.
- D. Provide a 24-inch expansion loop at each connection and directional change.
- E. Use a continuous wire between controller and remote-control valves.
- F. Except as otherwise approved, do not splice wire at any point.
- G. At locations where splicing is allowed, make splices within an acceptable splice box.
- H. Provide each controller with separate ground wire.
- I. A spare control wire of a different color shall be looped through every valve on the system.

**3.22 FLUSHING THE SYSTEM (GENERAL)**

- A. After all irrigation lines and risers are in place and connected, all necessary diversion work has been completed, and prior to installation of sprinkler heads, the control valves shall be opened, and a full head of water used to flush out the system.
- B. Bubblers and point source emission devices shall be installed only after flushing of the system has been accomplished to the complete satisfaction of the Owner's Representative.

**3.23 INSTALLATION OF OTHER COMPONENTS**

- A. Tools and Spare Parts: Prior to Review at completion of construction, supply to Owner operating keys, servicing tools, spare parts, test equipment, and other items indicated in General Notes on the drawings.
- B. Other Materials: Provide other materials or equipment shown on drawings or installation details that are part of irrigation system, even though items may not have been referenced in specifications.

**3.24 ADJUSTING THE SYSTEM**

- A. The Contractor shall flush and adjust all bubbler heads and drip emission devices for optimum performance.

- B. If it is determined that adjustment in the irrigation equipment will provide proper and more adequate coverage, the Contractor shall make such adjustments prior to planting. Adjustments may also include installation of additional drip emission devices as required.
- C. Lowering raised deep root watering systems by the Contractor shall be accomplished within 10 days after notification by Owner.
- D. The entire system shall be operating properly before any planting operations commence.

**3.25 MAINTENANCE**

- A. The entire irrigation system shall be fully operational prior to any planting.
- B. The Owner reserves the right to waive or shorten the operation period.
- C. Landscape irrigation system shall be fully maintained by the Contractor for a period of 90 days prior to final acceptance by the Owner. This period may be extended if the maintenance provisions are not met.

**3.26 COMPLETION CLEAN-UP**

- A. Upon completion of work, the Contractor shall smooth all ground surfaces. Refuse and excess dirt, excess materials, rubbish, debris, etc. shall be removed from the site. All walks, adjacent streets, parking lots, curbs, gutters, and trails shall be broomed or washed down; any damage sustained on the work of others shall be repaired to original conditions. Remove construction equipment from the premises.

**3.27 FINAL FIELD OBSERVATIONS PRIOR TO ACCEPTANCE**

- A. The Contractor shall operate each system in it's entirety for the Owner at time of final field inspection. Any items deemed not acceptable shall be reworked to the complete satisfaction of the Owner.
- B. The Contractor shall show evidence that the Owner has received all charts, accessories, record drawings and equipment as required before final field observation can occur.
- C. End of maintenance shall occur only on the written acceptance of the Owner.

**3.28 CLEANUP AND PROTECTION**

- A. During the duration of the project, keep adjacent paving and construction clean and work area in an orderly condition.

**3.29 DISPOSAL**

- A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off the project site.



**3.30 GUARANTEE**

- A. The Contractor shall guarantee the entire irrigation system against defects in materials and workmanship for a period of one (1) year from the date of acceptance of the work. The Contractor shall furnish a Faithful Performance Bond in the amount of 10% of the amount bid for the installation of the irrigation system to be in force for the one (1) year guarantee period.
- B. A copy of the guarantee form shall be provided at the time of contract award and shall also be included in the Operations and Maintenance Manual.
- C. The guarantee form shall be retyped onto the Contractor's letterhead and contain the following information.

**GUARANTEE FOR IRRIGATION SYSTEM**

We hereby guarantee that the irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the Drawings and Specifications. We agree to repair or replace all defects in material or workmanship which may develop during the period of one year from date of acceptance and also to repair or replace all damages resulting from the repair of such defects at no additional cost to the Owner. We shall make such repairs or replacements within a reasonable time, as determined by the Owner, after receipt of written notice. In the event of our failure to make such repairs or replacements within a reasonable time after receipt of written notice from the Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense, and we will pay the costs and charges therefore upon demand.

PROJECT  
LOCATION:  
CONTRACTOR/COMPANY:  
LICENSE NO.  
ADDRESS  
PHONE  
DATE OF FINAL ACCEPTANCE  
SIGNED:  
DATE:

END OF SECTION 32 84 00

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[ADDENDUM 4] SECTION 329300 – PLANTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ordering and delivering of plant materials
2. Planting soils
3. Trees, shrubs and groundcovers.
4. Tree stabilization.
5. Replacement of all unsatisfactory plant materials
6. Cleanup, preliminary inspection and approval
7. Protection, maintenance and warranty

B. RELATED SECTIONS:

1. Section 02 41 00 "Demolition" for site clearing
2. Section 31 00 00 "Earthwork" for excavation, filling, backfilling, and rough grading.
3. Section 01 56 39 "Tree Protection and Trimming"
4. Section 32 84 00 "Planting Irrigation"

C. APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1. American Standard for Nursery Stock ANSI Z60.1
2. American Standards for Tree Care Operations ANSI A300
3. Bay-Friendly Landscape Guidelines, Alameda County Waste Management Authority  
<http://www.stopwaste.org/home/index.asp?page=428>
4. OMRI Products List (Organic Materials Review Institute – [www.OMRI.org](http://www.OMRI.org))
5. Standard Specifications for Topsoil ASTM D 5268
6. TMECC (Test Methods for the Examination of Composting and Compost), from USCC (US Composting Council)

1.2 LANDSCAPE PRINCIPLES AND OBJECTIVES

CONTRACTOR shall maintain the specified landscape using an integrated approach, consistent with the principles set forth in the Bay-Friendly Landscape Guidelines, [www.BayFriendly.org](http://www.BayFriendly.org).

1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

- B. Bay-Friendly: A sustainable approach to landscape management that works in harmony with the natural conditions of the watershed. Bay-Friendly is a natural landscaping approach that fosters soil health and conserves water and other valuable resources while reducing waste and preventing pollution.
- C. Compost: A mixture of microbially balanced, biologically active, aerobically decayed organic matter, used to improve soil structure, balance soil biology, and provide nutrients.
- D. Compost Tea – Actively Aerated Compost Tea (AACT): An aerobic, microbially balanced, biologically active liquid solution containing living beneficial microbes, made by actively aerating compost extract in water under controlled conditions. Used to balance soil and plant biology
- E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.
- F. Crown: Also called "trunk flare" or "root flare": base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- G. Finish Grade: Elevation of finished surface of planting soil.
- H. OMRI: In the US, the Organic Materials Review Institute maintains list of approved organic products that can be used in certified organic crop production ([www.OMRI.org](http://www.OMRI.org)).
- I. Organic Fertilizer: A fertilizer made of natural materials that undergoes little or no processing and includes plant, animal, and/or mineral materials. Organic fertilizers do not contain any chemicals or synthetic compounds.
- J. Organic Soil Amendment: A soil amendment made of natural materials that undergoes little or no processing and includes plant, animal, and/or mineral materials. Organic soil amendments do not contain any chemicals or synthetic compounds.
- K. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- L. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- M. Planting Area: Areas to be planted.
- N. Planting Soil: Existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or topsoil that is modified with soil amendments to produce a soil mixture best for plant growth.
- O. Plant or Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, or herbaceous vegetation.

- P. Sheet Mulch: A layered mulch system for suppressing weed growth, optimizing soil microbial activity, reducing maintenance and improving nutrient and water retention in the soil.
- Q. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- R. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- S. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- T. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project Site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- U. Topsoil: Soil material used as a medium for establishing and sustaining healthy plant growth. Topsoil is obtained from the soil horizons normally designated as "A" or "B" as defined by the Soil Science Society of America.

#### 1.4 SUBMITTALS

- A. Procedures: Refer to 01 33 00 Submittals.
- B. Product Data and Certificates: For each type of product indicated:
  - 1. Plant Materials ordering certificates: Include quantities, sizes (caliper, head, and container), quality, and sources for plant materials.
  - 2. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to the Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.
  - 3. Organic Soil Amendment products: OMRI listed soil amendments only. Submit Manufacturer's certificate.
  - 4. For any manufactured products include Manufacturer's certified analysis of standard products.
- C. Samples for Verification: For each of the following:
  - 1. Organic Compost: ½ pound required; in sealed plastic bag labeled with composition of materials by percentage of weight and source. Sample shall be taken from the compost delivered to the site immediately after delivery; provide an accurate representation of color, texture, and organic makeup.
  - 2. Mulch: ½ pound required; in sealed plastic bag labeled with composition of materials by percentage of weight and source. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
  - 3. Organic Soil Amendments: quart size sample of each with required manufacturer's certificate, in sealed plastic bags or jars labeled with source of product.

4. Mycorrhizal fungi granular inoculant: sample with manufacturer's certificate required, in sealed plastic bag labeled with source of product.
  5. Worm Castings: 4 ounces required, in sealed plastic bag labeled with source information. Submit at least 2 weeks before commencement of work.
  6. Cardboard for use in Sheet Mulching: Width of roll by 12 inches.
- D. Qualification Data: For qualified Landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience implementing the Bay-Friendly approach, including Sheet Mulching. Include at least three projects in which Sheet Mulching has been implemented. Include project names, addresses, and year completed, and include names and addresses of OWNER'S REPRESENTATIVE's contact persons. Include verification of Bay-Friendly Qualification or equivalent, such as Green Gardener or G3 Certification.
- E. Compost Analysis: Before delivery of the compost, the supplier will submit a copy of lab analysis performed by a laboratory that is enrolled in the US Composting Council's CAP and is using the approved Test Methods for the Evaluation of Composting and Compost (TMECC).
- F. Water Quality Report: Submit written Water Quality Report from water source that will be used for irrigation at least 30 days prior to commencement of work.
- G. Soil Test Reports (Post Installation): Soil Fertility Test is required for standardized ASTM D 5268 topsoil, existing native surface topsoil, existing in-place surface soil and imported or manufactured topsoil.
1. Soil Fertility Test: For all soils submit soil fertility analysis after recommended soil amendments have been incorporated during soils preparation work. Provide soil fertility analysis from an approved testing laboratory per Section on Soil Testing.
- H. See Section 1.6

#### 1.5 QUALITY ASSURANCE

- A. Applicable standards and Best Management Practices (BMP's).
1. CONTRACTOR shall adhere to applicable professional standards as defined by a professional organization including:
    - a. American National Standard for Tree Care Operations – ANSI A300, Part 1
    - b. International Society of Arboriculture BMP for Tree Pruning
    - c. Irrigation Association BMP's
    - d. Bay Friendly Landscape Guidelines
- B. Installer Qualifications: A qualified Landscape Installer whose work has resulted in successful establishment of plants.
1. CONTRACTOR must have a valid California C-27 Contractor's License authorized by the State of California
  2. The CONTRACTOR shall have assigned to the project at least one employee who has experience or training in 'Bay-Friendly', 'River-Friendly' or equivalent "natural" landscaping practices, such as Green Gardener or G3 (Green Gardens Group) training.

3. Experience: At least three comparable landscape installation projects which include Sheet Mulching.
  4. The CONTRACTOR shall have assigned to the project at least one employee who is a Certified Arborist or Certified Tree Worker (International Society of Arboriculture).
  5. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project Site when work is in progress. Supervisor shall be a Bay-Friendly Qualified Landscape Professional, or equivalent, such as Green Gardener or G3 Certified Professional.
- C. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
- D. Plant Material Observation: OWNER'S REPRESENTATIVE shall be given the opportunity to observe plant material either at place of growth or at site before planting to check for compliance with requirements for genus, species, variety, cultivar, size, and quality. OWNER'S REPRESENTATIVE shall observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project Site.
1. Notify OWNER'S REPRESENTATIVE of sources of planting materials seven (7) days in advance of delivery to site.
- E. Preinstallation Conference: Conduct conference at Project Site one month before the Landscape Contractor is scheduled to begin work.
- 1.6 SOIL TESTING
- A. PRE-INSTALLATION Soil Fertility Analysis:
1. The CONTRACTOR shall obtain soil fertility tests of Imported topsoil or manufactured soil proposed for use.
- B. POST-INSTALLATION Soil Fertility Analysis:
1. The CONTRACTOR shall obtain soil fertility tests of Existing in-place soils, native surface topsoil, and imported or manufactured soil. Consult with the OWNER'S REPRESENTATIVE to determine the depth, location, and number of samples to be taken. Contact the OWNER'S REPRESENTATIVE at least two (2) months before landscape work is scheduled to begin.
  2. Soil Fertility Analysis shall be performed after soil amendments have been incorporated during soil prep work.
- C. Soil Fertility Analysis Requirements:
1. For each un-amended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; salinity, nitrate, ammonium, phosphate, potassium, calcium, magnesium, boron, sodium absorption ratio (SAR); deleterious material; heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium,

- and vanadium; pH; agricultural suitability, infiltration rate, and mineral and plant-nutrient content of the soil.
2. Follow the lab's instructions for collecting and packaging soil samples. A minimum of three representative samples shall be taken from varied locations for each soil that is used or amended for planting purposes.
  3. The tests shall be performed at CONTRACTOR's expense. The results of these tests shall be submitted to the OWNER'S REPRESENTATIVE for review by the OWNER'S REPRESENTATIVE to decide whether to accept the soil.
  4. Soil-Testing Laboratory Qualifications: An independent or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed, such as Soil And Plant Laboratory, Inc., 1101 S. Winchester Blvd., Suite G-173 San Jose, CA 95128 Phone: (408) 727-0330; Fax: (408) 727-5125 or Harmony Farm Supply, 3244 Hwy. 116 North, Sebastopol, California 95472; telephone (707) 823-9125, or other approved laboratory.
  5. CONTRACTOR shall request that the laboratory make soil amendment recommendations based on an 'Organic' approach to soil and landscape management, including the use of Greenwaste compost. Request that lab state the amount of compost that is required to bring soil organic matter content to a minimum of 5%.
  6. Lab shall report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, lab shall provide additional recommendations for corrective action.

**1.7 DELIVERY, STORAGE, STOCKPILING, AND HANDLING**

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.
- B. Bulk Materials:
  1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants or under tree canopies. Locate bulk materials per the direction of the OWNER'S REPRESENTATIVE.
  2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
  3. Accompany each delivery of bulk organic soil amendments with appropriate certificates.
- C. Soil and compost
  1. Suitable topsoil that is to be removed during construction shall be stockpiled for reuse on site. Stockpile location shall be approved by OWNER'S REPRESENTATIVE.
  2. Compost shall be delivered to site at least 2 weeks prior to commencement of work, and sample submitted to OWNER'S REPRESENTATIVE.
  3. Compost that is warm to the touch shall be rejected as unfinished.



4. Soil and compost that is to be stockpiled for longer than two weeks shall not be placed in mounds higher than 6 feet.
  5. Soil and compost that is stockpiled shall be covered at least two weeks prior to installation to prevent excess moisture from saturating the soil stockpile. Check moisture content at least two days prior to soil installation.
  6. Soil materials shall not be handled or hauled, placed, or compacted when it is wet, as during or after rain, nor when frozen.
- D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- E. Handle planting stock by root ball or container, not foliage or branches.
- F. Deliver plants to site after preparations for planting have been completed, and install immediately after approval. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
1. Notify OWNER'S REPRESENTATIVE to inspect plants upon delivery. Plants not accepted shall be tagged for removal, and shall be removed from site immediately.
  2. Do not remove container-grown stock from containers before time of planting.
  3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

**1.8 PROJECT CONDITIONS**

- A. Notify OWNER'S REPRESENTATIVE at least 3 working days prior to installation of plants.
- B. Protect existing utilities, paving, irrigation and other facilities from damage caused by landscape operations. CONTRACTOR shall contact the local utility companies for verification of the location of all underground utilities, and shall be responsible for all damage resulting from neglect or failure to comply with this requirement.
- C. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- D. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by the OWNER'S REPRESENTATIVE unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:
1. Notify OWNER'S REPRESENTATIVE no fewer than five (5) business days in advance of proposed interruption of each service or utility.
  2. Do not proceed with interruption of services or utilities without OWNER'S REPRESENTATIVE's written permission.

- E. Planting Restrictions: Plant during the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
  - 1. Fall Planting: End of September to Beginning of December
  - 2. Spring Planting: Beginning of February to End of April
- F. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Planting shall not be done while soils are wet, as after or during rain. Planting shall not be done when temperature is above 90 degrees Fahrenheit. Apply soil amendments during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

#### 1.9 WARRANTY

- A. Warranty: Installer agrees to replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by OWNER'S REPRESENTATIVE, or incidents that are beyond CONTRACTOR's control.
    - b. Structural failures including plantings falling or blowing over.
    - c. Faulty performance of tree stabilization.
    - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 2. Warranty Periods from Date of Planting Completion:
    - a. Trees, Shrubs, and Ornamental Grasses: 12 months.
    - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
  - 3. Include the following remedial actions as a minimum:
    - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
    - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
    - c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
    - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

#### 1.10 MAINTENANCE SERVICE

- A. Initial Maintenance Service for all Trees, Shrubs and Perennials: Follow Bay-Friendly Guidelines. Provide maintenance by skilled employees of Landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
  - 1. Maintenance Period: twelve (12) months from substantial completion of project. Continuing Maintenance: Follow Bay-Friendly Guidelines. For ongoing yearly maintenance, starting on

date initial maintenance service is concluded. See Project Maintenance Guidelines, to be supplied by OWNER'S REPRESENTATIVE.

## PART 2 - PRODUCTS

### 2.1 PLANT MATERIAL

- B. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
- C. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots will be rejected.
- D. Tree caliper measurements shall be taken on the trunk 6 inches above the natural ground line for trees up to and including 4 in. in caliper, and 12 inches above the natural ground line for trees over 4 in. in caliper. Height and spread dimensions specified refer to the main body of the plant and not from branch tip to branch tip.
- E. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- F. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to OWNER'S REPRESENTATIVE, with a proportionate increase in size of roots or balls.
- G. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- H. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as shown on Drawings.
- I. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.
- J. Substitutions of plant materials will not be permitted unless authorized in writing by the OWNER'S REPRESENTATIVE. If proof is submitted in writing that a plant specified is not obtainable, consideration will be given to the nearest available size or similar variety, with a corresponding adjustment of the contract price.

2.2 PLANTING SOILS

- A. All planting areas shall provide a minimum depth of twelve inches of un-compacted soil except where tree roots limit the depth.
- B. Native Topsoil:
  - 1. Shall be on-site existing topsoil after all rocks over two inches and all foreign debris have been removed. Native topsoil shall be free of any substance harmful to plant growth and shall have organic material and soil characteristics capable of sustaining healthy plant life. Heavy clay soil shall not be considered for use as topsoil. Suitable native topsoil shall be stockpiled for re-use where required to replace existing topsoil.
  - 2. Topsoil shall be tested in accordance with Section "Soil Fertility Testing".
  - 3. If the stockpile of existing topsoil is not adequate to meet the requirement to place minimum of 6 inches of topsoil in all planting areas import topsoil shall be used to meet the requirement.
- C. Import Topsoil:
  - 1. Imported Topsoil or Manufactured Topsoil: shall be sandy loam, or a mixture of sandy loam and aged compost, screened and free of stones 1 inch or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants including bermuda grass, quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and brome grass; not infested with nematodes; grubs; or other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled pore space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.
  - 2. All imported topsoil shall have an agricultural suitability test, dated within thirty (30) days of delivery and indicating compliance with these specifications, by a qualified soils laboratory prior to delivery to the Project Site. Results shall be sent to the OWNER'S REPRESENTATIVE.
- D. Soil fertility test results:
  - 1. Planting soil that does not meet the following will not be accepted:
    - a. Organic content not less than 2% by weight.
    - b. Texture: Sandy loam
    - c. pH value between 5.5 and 7.5 with no excess lime.
    - d. Saturation extract solution must show that salinity is less than 3.0 DF/ and Boron is less than 1.0 ppm
    - e. Particle Size: One composite, representative sample of existing soil shall be taken and analyzed for particle size only.

- f. Soil should meet USDA specifications for the desired texture with at least 100% passing 25.4 mm screen and at least 90% passing 9 mm screen. At least 85% of the sand fraction should fall within the medium fine and very fine sand range (0.05 to 0.5 mm).
2. Fertility: Follow all recommendations of the OWNER'S REPRESENTATIVE based on the Soil Fertility Test results.
3. Pests: If imported soil has been used for agricultural purposes within the prior 12 months, it shall be tested for parasitic nematodes.
4. Herbicide contamination: If herbicide contamination is suspected then a radish/ryegrass growth trial must be performed. Consult with OWNER'S REPRESENTATIVE prior to decision to test or not.

### 2.3 ORGANIC SOIL AMENDMENTS AND FERTILIZERS

- A. Organic Soil Amendments shall be first quality organic agricultural products approved for use in organic crop production by OMRI (Organic Materials Review Institute), see [www.OMRI.org](http://www.OMRI.org). Soil amendments that are not approved or are restricted for use shall be applied only after review and written approval by the OWNER'S REPRESENTATIVE. The OWNER'S REPRESENTATIVE shall determine appropriate amendments for the species of plants to be established following review of the soil fertility test results.
- B. Organic Compost: Compost shall be a well decomposed, fully stabilized, weed free organic matter source. The product shall be certified through the US Composting Council's (USCC) Seal of Testing Assurance Program (STA) Program (a compost testing and information disclosure program). It shall be derived from agricultural or food waste or yard trimmings. The product shall contain no substances toxic to plants, will possess no objectionable odors and shall not resemble the feedstock (the original materials from which it was derived).
  1. The submitted lab report shall verify:
    - a. Feedstock Materials shall be specified and include one or more of the following: landscape/yard trimmings, grass clippings, food scraps, and agricultural crop residues.
    - b. Organic Matter Content: 50% - 65% by dry wt. preferred, 35-70% acceptable
    - c. Carbon and Nitrogen Ratio: C:N < 25:1 plus at least one measure of stability and at least one measure of toxicity.
    - d. Maturity/Stability: shall have a dark brown color and a soil-like odor. Compost exhibiting a sour or putrid smell, containing recognizable grass or leaves, or is hot (120F) upon delivery or rewetting is not acceptable. In addition any one of the following is required to indicate stability
      - 1) Oxygen Test < 1.3  $O_2$  / unit TS / hr
      - 2) Specific oxy. Test < 1.5  $O_2$  / unit BVS / hr
      - 3) Respiration test < 8 C / unit VS / day
      - 4) Dewar test < 20 Temp. rise (oC)
      - 5) Solvita® > 5 Index value
    - e. Toxicity: any one of the following measures is sufficient to indicate non-toxicity.
      - 1)  $NH_4^-$  :  $NO_3^-$ -N < 3
      - 2) Ammonium < 500 ppm, dry basis
      - 3) Seed Germination > 80 % of control

- 4) Plant Trials > 80% of control
  - f. Nutrient Content: provide analysis detailing nutrient content including N-P-K, Ca, Na, Mg, S, and B.
    - 1) Total Nitrogen content 0.9% or above preferred.
    - 2) Boron: Total shall be <80 ppm; Soluble shall be <2.5 ppm
  - g. Salinity: Must be reported; may vary but < 4.0 mmhos/cm preferred. Soil should also be tested: <2.5 mmhos/cm is preferred for soil/compost blend but may vary with plant species.
  - h. pH: pH shall be between 6.5 and 8. May vary with plant species.
  - i. Particle size: 95% passing a 1/2" screen.
  - j. Bulk density: shall be between 500 and 1100 dry lbs/cubic yard
  - k. Moisture Content shall be between 35% - 55% of dry solids.
  - l. Inerts: compost shall be relatively free of inert ingredients, including glass, plastic and paper, < 0.1 % by weight or volume.
  - m. Weed seed/pathogen destruction: provide proof of process to further reduce pathogens (PFRP). For example, turned windrows must reach min. 55C for 15 days with at least 5 turnings during that period.
  - n. Select Pathogens: Salmonella <3 MPN/4grams of TS, or Coliform Bacteria <10000 MPN/gram.
  - o. Trace Contaminants Metals (Lead, Mercury, Etc.) Product must meet US EPA, 40 CFR 503 regulations.
- C. Mycorrhizal Fungi: Dry, granular, water soluble inoculant containing at least 5300 spores per pound of vesicular-arbuscular mycorrhizal fungi and 95 million spores per pound of ectomycorrhizal fungi, and a maximum of 5.5 percent inert material.
- D. Worm Castings: available through Sonoma Valley Worm Farm, (707) 996-8561
- E. Additional amendments and/or fertilizers as required based on the soils report.
- 1. Additional amendments and fertilizers that are approved for use by the Organics Materials Research Institute (OMRI) for use in crop production may be approved for use by the OWNER'S REPRESENTATIVE. See [www.omri.org](http://www.omri.org). Fertilizers that are not approved or are restricted for use by OMRI shall be applied only after review and written approval by the OWNER'S REPRESENTATIVE.
  - 2. Soil Amendment Application Rates: Rates shown are FOR BIDDING PURPOSES ONLY. The OWNER'S REPRESENTATIVE shall establish amendment application rates that are appropriate for the plant species to be established after review of the soil test results. The contract price shall be adjusted up or down to reflect the actual soil amendments required. For estimating purposes, assume the listed rates of application:
    - a. Azomite - 6 pounds per 1000 square feet
    - b. Compost - 3 cubic yards/ 1000 square feet
    - c. Worm castings – 1/2 Cubic Yard per 2500 square feet
    - d. Mycorrhizal Fungi - Use 1 tsp/5cc for small trees and shrubs; 1-4 tablespoons for larger trees.

## 2.4 MULCH

- A. Organic Mulch material shall be locally produced arbor chip mulch from tree and shrub trimming, 100% recycled material, with no color additive. The mulch shall not contain significant amounts of trimmings from pine or cedar unless well aged. The mulch shall not contain trimmings from eucalyptus trees, or any noxious weeds, plants with thorns or spines, or invasive plants. The largest allowable pieces not larger than 3" in any direction. Bark mulch or shredded redwood bark mulch ("Gorilla hair") shall not be used. 'Mixed and Aged, screened 3" minus' mulch from Greenwaste Recycle Yard, Richmond, CA; "Arbor Mulch" from Grover Landscape, Modesto, CA; Grab n' Grow Arbor Mulch from Grab n' Grow Soil Products, Santa Rosa, CA ; or approved local equivalent. Color: Natural
- B. Trees or shrubs to be removed shall be chipped on site to be used as mulch. Vegetation with thorns or spines, or eucalyptus or invasive plants shall not be used for mulch.
- C. Sheet Mulching shall be employed for all areas using 100% recycled B flute cardboard with locally produced arbor chip mulch from tree and shrub trimming. Cardboard is available in 3' or 4' wide rolls from North Bay Paper, Petaluma, CA 800-734-2772, or Monahan Paper, Oakland, CA 800-835-4670

## 2.5 PESTICIDES AND HERBICIDES

- A. No synthetic or chemical pesticides shall be used.
- B. An Integrated Pest Management (IPM) program shall be implemented when needed to monitor for the presence of pests, evaluate pest impact to plant health and appearance and nuisance to the public, and provide control treatments that have minimal negative effects on all but the pest and that protect air and water quality and human health. Preference shall be given to non-toxic biological methods and non-pesticide alternatives when considering the use of pest control agents.
- C. Cultural controls and Mechanical or Physical methods will be used as the first choice in weed management and eradication.
- D. Sheet mulching, a layered system of non-synthetic weed barrier overlain by mulch, shall be employed where possible.
- E. For weed control, non-chemical herbicides using Fatty acids, Acetic and Citric acids, or Clove, Citrus, Mint and Thyme oil may be employed by CONTRACTOR as a last resort. These may include:
  - 1. Fatty acid potassium salts (e.g. Safer's Superfast Weed and Grass Killer)
  - 2. Acetic and citric acids (e.g. Nature's Glory Weed and Grass Killer RTU)
  - 3. Clove, citrus, mint and thyme oil (e.g. Matran II, Burnout, Xpress)

## 2.6 TREE STABILIZATION MATERIALS

- A. Most trees do not require staking. Stake or guy a tree only when necessary for the specific conditions encountered and with the approval of the OWNER'S REPRESENTATIVE.

- B. Staking may be required in unusual circumstances such as sandy soils in either the root ball or adjacent soils or in extremely windy locations. Poor-quality trees with cracked, wet, or loose root balls, poorly developed trunk-to-crown ratios, or undersized root balls shall be rejected if they require staking, unless written approval to permit staking or guying as a remedial treatment is obtained from the OWNER'S REPRESENTATIVE. Trees that settle out of plumb due to inadequate soil compaction either under or adjacent to the root ball shall be excavated and reset. In no case shall trees that have settled out of plumb be pulled upright using guy wires.
- C. Stakes and ties shall be installed immediately upon approval or planting, and shall be removed at the end of the first growing season. Any tree that is not stable at the end of this time shall be rejected.
- D. Stakes: Rough-sawn, untreated, sound, new lodgepole pine, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.
- E. Ties: black, corded rubber tree ties or ArborTie Flat woven polypropylene material, 3/4" ( cm) wide, 900 lbs. (409 kg) break strength. Length as required by tree staking details on the Drawings. Fasten to stake as noted on Drawings.
- F. New Tree Protection Fence: See plans.

## 2.7 EROSION-CONTROL MATERIALS

- A. Compost Blankets: A 1"-3" thick layer of loosely applied compost or composted material placed on the soil.
- B. Compost Filter Berms: A dike of compost or a compost product, trapezoidal in cross section, is placed perpendicular to sheet-flow runoff.
- C. Compost Filter Sock: A compost filter sock is a type of contained compost filter berm. It is a mesh tube filled with composted material that is placed perpendicular to sheet-flow runoff to control erosion and retain sediment in disturbed areas.
- D. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.
- E. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd., with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.
  - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint



thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area. If foreign or deleterious material is found remove the soil and contamination as directed by OWNER'S REPRESENTATIVE and replace with new planting soil.

2. Do not mix or place soils and soil amendments in frozen, wet, rainy, or muddy conditions.
3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures as needed to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkway

### 3.3 PLANTING AREA SOIL PREPARATION

- A. Planting area soils where soil must be loosened to alleviate compaction:
1. Rip or scarify soil to less than 200 psi to a total depth of 18 inches below final topsoil grade.
  2. Ripping shall form a two-directional grid with channels spaced a minimum of 12 inches apart.
  3. Do not rip, scarify or till within drip line of existing trees to be retained.
  4. Do not rip, scarify or till over utility installations within 30 inches of the surface, or where trenching or drainage lines are installed.
  5. Lightly incorporate organic soil amendments into the top six inches of soil after ripping has taken place, using application rates recommended by soils test, unless directed otherwise by OWNER'S REPRESENTATIVE.
- B. Planting areas that will receive imported soil:
1. Before adding imported topsoil, scarify subsoils to less than 200 psi to a depth of 18 inches below final topsoil grade.
  2. Do not scarify or till within drip line of existing trees to be retained.
  3. Place first lift of three inches of imported topsoil on scarified surface and till into subsoil.
  4. Place second lift of three inches or more of imported topsoil on surface to achieve a minimum depth of 18 inches of friable soil.
  5. Lightly incorporate organic soil amendments into the top six inches of soil after ripping has taken place, using application rates recommended by soils test, unless otherwise directed by OWNER'S REPRESENTATIVE.
- C. Planting beds are to be graded smooth and level, 3" minimum below adjacent paving to accommodate sheet mulch.

- D. Verify that all planting beds shall have a minimum depth of twelve inches of uncompacted soil except where tree roots limit the depth. Soil compaction may be measured using a soil cone penetrometer.
- E. Ripping: When ripping, use a chisel plow subsoil ripping tool mounted on a machine of sufficient power to make vertical trenches 18 inches deep into the subsoil, 24" apart. Run the ripping tool over each area in opposite directions so that each area is ripped twice to thoroughly break up the compacted subgrade material prior to the installation of topsoil and planting mix.
- F. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off the property.
- G. Phase the installation of the soil such that equipment does not have to travel over already installed topsoil or planting mixes.
- H. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
- I. Remove any noxious or invasive weeds and dispose of them off site.
- J. Lay out trees and large shrubs at locations and at spacing indicated on plans. Stake locations of individual trees and shrubs and outline areas for multiple plantings. Adjust locations when requested, and obtain OWNER'S REPRESENTATIVE's acceptance of layout before excavating or planting. Make minor adjustments as required.
- K. Water entire planting area thoroughly. This may be done the day before planting.

**3.4 ORGANIC SOIL AMENDMENT AND FERTILIZER APPLICATION**

- A. Apply organic soil amendments directly to surface of prepared planting area, at rates recommended by soils test, unless otherwise directed by OWNER'S REPRESENTATIVE.
- B. If using No-Till method, do not remove weeds or till soil. Following application of soil amendments cover with layer of compost. Sheet mulch will be applied directly over compost layer.
- C. If using planting area preparation method where soil is loosened to alleviate compaction, gently incorporate the soil amendments into the top six inches of soil. Cover with layer of compost. Sheet mulch will be applied directly over compost layer.

**3.5 EXCAVATION FOR TREES AND SHRUBS**

- A. Planting Pits and Trenches:
  - 1. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Planting pit shall be at a depth that will ensure that the root flare will be 5 to 6 inches above adjacent finish grade in all areas that will be sheet mulched. Where sheet mulching will not be employed the root flare shall be 3 to 4 inches above finish grade. Scarify sides of planting

- pit smeared or smoothed during excavation. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
2. Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Excavate so that base of planting pit is approximately two times as wide as ball diameter for container-grown stock.
  3. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
  4. Maintain supervision of excavations during working hours.
  5. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
- B. Subsoil and topsoil removed from excavations shall be used for backfill if suitable.
- C. Obstructions: Notify OWNER'S REPRESENTATIVE if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
- D. Detrimental soil conditions: The OWNER'S REPRESENTATIVE is to be notified, in writing, of soil conditions encountered, including poor drainage or unexpected water, which the CONTRACTOR considers detrimental to the growth of plant material. When detrimental conditions are observed, planting shall be discontinued until instructions to resolve the conditions are received from the OWNER'S REPRESENTATIVE.

### 3.6 DRAINAGE TEST AND AUGER HOLES

- A. Requirements: After tree pits are dug and before planting operations, tree pits shall be water tested for drainage. One location per 80 square feet of tree pit shall be tested. In addition, test all tree pits in any area where a test tree pit does not drain within 24 hours, such as in hardpan areas, rocky ground, construction backfill, compacted areas, flat ground, low spots, and the like, in order to ensure that pits in those areas will drain properly.
- B. Tests: Fill tree pits with water. Check holes after 24 hours to determine if water has drained out. If the water has not drained out, bring this to the attention of the OWNER'S REPRESENTATIVE for remedial course of action. Adjustment of pit size, adjustment of pit location, or addition of auger holes will be required by the OWNER'S REPRESENTATIVE if a drainage problem exists.
- C. Auger Holes: Auger one 6-inch diameter hole through the bottom of each excavated plant hole that does not drain within the specified 24-hour period. Depth of the drill measured from the bottom of the excavation to the bottom of the drill hole shall be 4 feet. Backfill auger holes with 3/4-inch diameter, well-graded drain rock up to bottom of the plant hole.

### 3.7 TREE AND SHRUB PLANTING (5 GALLON SIZE AND LARGER)

- A. All plants 5-gallon size and larger shall be planted before installation of the Sheet Mulching System.
- B. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most

root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

- C. Apply Mycorrhizal fungi granular inoculant to roots: Sprinkle inoculant directly on damp roots or rootballs of all shrubs immediately before planting. 3 lbs. of inoculant will treat at least 400 typical-size transplants. Use 1 tsp/5cc for small trees and shrubs; 1-4 tablespoons for larger trees.
- D. Set container-grown stock plumb and in center of planting pit or trench with root flare of trees 5 to 6-inches above adjacent finish grades and root flare of shrubs 3 to 4 inches above adjacent finish grades in all areas that will be sheet mulched. Set root flares of trees 4 inches and shrubs 3 inches above adjacent finish grades in areas that will not be sheet mulched.
  - 1. Use un-amended native soil for backfill if planting in native soil.
  - 2. Use imported soil for backfill if planting in imported soil.
  - 3. Carefully remove root ball from container without damaging root ball or plant.
  - 4. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
  - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- E. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

### 3.8 TREE AND SHRUB PRUNING

- A. Prune, thin, and shape trees and shrubs only if approved by OWNER'S REPRESENTATIVE, according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by OWNER'S REPRESENTATIVE, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.
- B. Do not apply pruning paint to wounds.

### 3.9 TREE STABILIZATION

- A. If required, install trunk stabilization as follows unless otherwise indicated:
  - 1. Install Tree stakes as shown on drawings; avoid penetrating root balls or root masses.
  - 2. Support trees with bands of flexible ties as shown on drawings. Allow enough slack to avoid rigid restraint of tree.

### 3.10 SHEET MULCH INSTALLATION

- A. After the planting area has been thoroughly watered, the organic soil amendments, including compost, have been applied to surface of planting areas, and the 5 gallon and larger plant materials have been planted, the Sheet Mulch shall be installed
- B. Apply a minimum of two layers of 100% recycled B flute cardboard as a bio-degradable weed barrier to the entire planting area, completely covering all existing soil and vegetation.

1. If subsurface drip irrigation is used, apply cardboard to surface after subsurface irrigation system has been installed.
2. Wet cardboard thoroughly while applying to prevent it from blowing away.
3. Avoid walking on wet cardboard.
4. Do not allow any loose soil to remain on top of cardboard.
5. Edges of the sheets of cardboard shall overlap a minimum of 8".
6. Cardboard shall abut directly against edge of pavement, curbs and boulders.
7. Cardboard shall be applied to the edge of installed plant root balls without covering any part of the top of the root ball / root crown area.
8. Excess cardboard shall be folded under itself when abutting against hardscape objects or root crown areas, as opposed to being cut, to avoid excessive cardboard scraps. This folding under process is greatly aided when the cardboard is wet.
9. Keep all cardboard scraps separate from other construction debris for depositing at a local recycling facility.

C. Apply mulch to top of cardboard:

1. Apply 1" arbor chip mulch on top of the cardboard to protect cardboard during the planting of 1 gallon and smaller pots.
2. Apply 5" additional arbor chip mulch on top of first application of mulch after planting 1 gallon and smaller pots.

D. Do not place mulch or compost within 6 inches of trunks or stems.

E. Where planting areas are adjacent to paving, gradually taper depth of mulch so that top of mulch meets top of paving.

**3.10 SMALL SHRUB, GROUND COVER AND PERENNIAL PLANTINGS**

A. Any plants less than 5-gallon size shall be installed after sheet mulching.

B. Set out and space ground cover and plants smaller than 5-gallon size as indicated on plans in even rows with triangular spacing. Final layout to be adjusted in the field with collaboration of Landscape Architect.

C. Apply Mycorrhizal fungi granular inoculant to rootballs of all plants during planting: sprinkle 1/4 tablespoon of inoculant directly on damp roots or rootballs immediately before planting or scatter inoculant in planting holes. 3 lbs. of inoculant will treat at least 400 typical-size transplants. Use 1 tsp/5cc for small trees and shrubs; 1-4 tablespoons for larger trees. Direct contact with roots is critical.

D. Plant 1-gallon plants through the cardboard mulch, pushing extra soil under the cardboard layer. Take care not to allow any soil to remain on top of cardboard or mulch.

- E. Plant 4" and smaller plants into the mulch on top of the cardboard without cutting through the cardboard. Backfill around plants with several handfuls of compost on top of cardboard and under mulch.
- F. Use native soil for backfill for larger plants.
- G. Do not leave excess soil on top of sheet mulch. Push excess soil under cardboard.
- H. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- I. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- J. Keep mulch 6" min. from root crown.
- K. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

### 3.11 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing with organic fertilizers as need is shown by soil testing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.
- A. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- B. Mulch shall be replenished as needed to maintain a depth of 6". Additional cardboard under mulch or thicker mulch may need to be used for persistent weeds.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

### 3.12 FERTILIZERS, PESTICIDES, AND HERBICIDES

- A. No chemical fertilizers, herbicides, pesticides or other disease control chemicals to be used. Only materials approved for organic crop production by the Organic Materials Review Institute (OMRI) may be used, and only with approval from OWNER'S REPRESENTATIVE. See [www.omri.org](http://www.omri.org). Integrated Pest Management (IPM) practices shall be used.

### 3.13 CLEANUP AND PROTECTION

- A. During planting, keep adjacent paving and construction and work area clean and orderly.
- B. Protect plants from damage due to landscape operations and operations of other CONTRACTORS and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

- C. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project Site.
- D. Any shrubs or trees to be removed shall be chipped on site and used for mulch. All resulting mulch shall meet requirements of this specification.
- E. Weeding, Cultivating, and Cleanup: Planting areas shall be kept neat and free from debris at all times. All areas shall be weed free at end of plant establishment and maintenance period.
- F. Disposal: Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash and debris and dispose of them off OWNER'S property.

END OF SECTION

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