ELECTRICAL SYMBOLS LIST

SYMBOL	DESCRIPTION
	DUPLEX CONVENIENCE OUTLET MOUNTED IN SURFACE BOX AT +18" AFF UNLESS NOTED OTHERWISE.
	SURFACE MOUNTED BRANCH CIRCUIT PANELBOARD.
J	JUNCTION BOX, SURFACE MOUNTED AT +18" AFF UNLESS NOTED OTHERWISE.
J	JUNCTION BOX WITH FLEXIBLE CONDUIT CONNECTION.
	BRANCH CIRCUIT CONDUIT, CONCEALED IN WALL OR CEILING.
	BRANCH CIRCUIT CONDUIT, CONCEALED IN FLOOR OR UNDERGROUND.
	BRANCH CIRCUIT CONDUIT, RUN EXPOSED.
	2# 12, 3/4"C. 5# 12, 3/4"C.
	3# 12, 3/4"C. 6# 12, 3/4"C.
	4# 12, 3/4"C.
F J	DISCONNECT SWITCH, "F" INDICATES FUSED TYPE, MOUNTED AT +54" AFF UNLESS NOTED OTHERWISE.
	MAGNETIC MOTOR STARTER, MOUNTED AT +54" AFF UNLESS NOTED OTHERWISE.
J	COMBINATION MOTOR STARTER, MOUNTED AT +54" AFF UNLESS NOTED OTHERWISE.
A-1	BRANCH CIRCUIT HOMERUN WITH PANEL AND CIRCUIT DESIGNATED
	FLEXIBLE CONDUIT W/ POINT OF CONNECTION.
	POINT OF CONNECTION.
$	SWITCH MOUNTED IN SURFACE BOX, +42" AFF UNLESS NOTED OTHERWISE.
$ a,b,c	SPST WALL SWITCH, LETTERS INDICATE THE NUMBER OF SWITCHES AND OUTLETS THEY CONTROL. MOUNTED IN BOX AT +42" AFF U.O.N.
$ D	WALL BOX DIMMER, +42" AFF UNLESS NOTED OTHERWISE.
	PUSHBUTTON STATION.
C	CONTACTOR COIL.

ABBREVIATIONS

SUFFIX	DESCRIPTION
MV	MERCURY VAPOR.
MH	METAL HALIDE.
MIN.	MINIMUM.
MCA	MINIMUM CIRCUIT AMPS.
MCM	THOUSAND CIRCULAR MILS.
MFR.	MANUFACTURER.
MTD	MOUNTED.
MCP	MOTOR CIRCUIT PROTECTOR.
MW	MICROWAVE.
NEC	NATIONAL ELECTRICAL CODE.
NEMA	NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION.
NC	NORMALLY CLOSED.
NO	NORMALLY OPENED.
NF	NON-FUSED.
NIC	NOT IN CONTRACT.
NL	NIGHT LIGHT.
N.T.S.	NOT TO SCALE.
NL	NIGHT LIGHT.
NO. or #	NUMBER.
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED.
%Z	PERCENT IMPEDANCE.
PH. or ~	PHASE.
PC	PHOTOCELL
P	POLE.
PVC	POLY VINYL CHLORIDE.
PDU	POWER DISTRIBUTION UNIT.
PRIMARY	OVER 600 VOLTS.
PROVIDE	FURNISH, INSTALL AND CONNECT.
PT	POTENTIAL TRANSFORMER.
PA	PUBLIC ADDRESS.
REC, RECEPT	RECEPTACLE.
REF	REFRIGERATOR.
RGS	RIGID GALVANIZED STEEL.
RL	RUNNING LIGHT.
S	SINGLE LINE DIAGRAM.
SCC	SHORT CIRCUIT CURRENT.
SFD	SMOKE FIRE DAMPER.
SQ.	SQUARE.
STB	SHUNT TRIP BREAKER.
SU	SITE UTILITIES.
TC	TIMECLOCK.
TEL/DATA	TELEPHONE AND DATA.
TV	TELEVISION.
T.V.S.S.	TRANSIENT VOLTAGE SURGE SUPPRESSION.
TYP	TYPICAL.
U.G.P.S.	UNDERGROUND PULL SECTION.
U.O.N.	UNLESS OTHERWISE NOTED.
U.P.S.	UNINTERRUPTABLE POWER SYSTEM.
VAV	VARIABLE AIR VOLUME.
V	VOLTS.
VA	VOLT AMPERES.
VD	VOLTAGE DROP.
WP	WEATHERPROOF.
W	WIRE.
XFMR	TRANSFORMER.
X	INDICATES EXISTING TO REMAIN.
XR	INDICATES EXISTING TO BE REMOVED.
XL	INDICATES EXISTING TO BE RELOCATED.
XN	INDICATES NEW LOCATION OF RELOCATED EQUIPMENT.

ABBREVIATIONS

SUFFIX	DESCRIPTION
4S	4" SQUARE BY 2 1/8" DEEP BOX.
ADA	AMERICAN WITH DISABILITIES ACT.
AFF	ABOVE FINISH FLOOR.
AFG	ABOVE FINISH GRADE.
AWG	AMERICAN WIRE GAUGE.
AMP, A	AMPERE.
A.I.C.	AMPERES INTERRUPTING CAPACITY (SYMMETRICAL).
AF/AT	AMP FRAME, AMP TRIP
AS/AF	AMP SWITCH, AMP FUSE.
ATS	AUTOMATIC TRANSFER SWITCH.
AUX	AUXILIARY CONTACTS.
BR	BRANCH.
BLDG	BUILDING.
CIRC., CKT.	CIRCUIT.
CB	CIRCUIT BREAKER.
SFD	COMBINATION SMOKE FIRE DAMPER.
C	CONDUIT.
C.O.	CONDUIT ONLY, COMPLETE WITH PULLSTRING.
CONN	CONNECTED.
CT	CURRENT TRANSFORMER.
CPT	CONTROL POWER TRANSFORMER.
DIA	DIAMETER.
DISC	DISCONNECT.
DIST	DISTRIBUTION.
E.C.	ELECTRICAL CONTRACTOR.
EMS	ENERGY MANAGEMENT CONTROL SYSTEM.
EMT	ELECTRICAL METALLIC TUBING.
EWC	ELECTRIC WATER COOLER.
E.P.O.	EMERGENCY POWER OFF.
EF	EXHAUST FAN.
FT or '	FEET.
FA	FIRE ALARM.
FLA	FULL LOAD AMPS.
GRND	GROUND.
GFCI	GROUND FAULT CIRCUIT INTERRUPTER.
HOA	HAND-OFF-AUTO.
HACR	HEATING AIR CONDITIONING REFRIGERATION.
HVAC	HEATING, VENTILATING AND AIR CONDITIONING.
H.,W.,D.,L.	HEIGHT, WIDTH, DEPTH, LENGTH.
HID	HIGH INTENSITY DISCHARGE.
HP	HORSEPOWER.
HPS	HIGH PRESSURE SODIUM.
IN. or "	INCHES.
IG	ISOLATED GROUND.
JBOX	JUNCTION BOX.
K	DEGREE KELVIN.
KAIC	KILOVOLT AMPERES AVAILABLE INRUSH CURRENT.
KVA	KILOVOLT AMPERES.
KW	KILOWATT.
KWH	KILOWATT HOUR.
L.F.	LINEAR FEET.
LTG, LTS	LIGHTING.
LPS	LOW PRESSURE SODIUM.
MAX.	MAXIMUM.
MOCP	MAXIMUM OVERCURRENT PROTECTION.
MCB	MAIN CIRCUIT BREAKER.
MLO	MAIN LUGS ONLY.
M	METER.
M/M	METER MAIN.

LIGHTING FIXTURE SCHEDULE

SYMBOL	LABEL	DESCRIPTION	MANUFACTURER / MODEL #	FIXTURE VOLTAGE	INPUT WATTS	LUMENS	LAMP	DETAIL/ NOTES
	A	CEILING LIGHT	QUORUM BELFOUR EXTERIOR QUO-301-69 NOIR 301-39	120V	25	-	-	-
	B	10" TALL OUTDOOR WALL SCONCE	QUORUM BELFOUR SINGLE QUO-701-69 NOIR 301-39	120V	25	-	-	-
	C	LED STREET LAMP	COMMERICAL ELECTRIC INTEGRATED FLOOD DW8899ABZ-B	120V	46	5000	-	-

VOLTAGE DROP NOTES

1. FEEDER LENGTH SHOWN FOR VOLTAGE DROP CALCULATIONS ONLY. CONTRACTOR TO VERIFY FEEDER LENGTHS IN FIELD.
2. 20A, 120V CIRCUITS LONGER THAN 100' - USE #10AWG TO LIMIT VOLTAGE DROP ON BRANCH CIRCUITS TO 3%
3. 20A, 120V CIRCUITS LONGER THAN 150' - USE #8AWG TO LIMIT VOLTAGE DROP ON BRANCH CIRCUITS TO 3%
4. 20A, 277V CIRCUITS LONGER THAN 150' - USE #10AWG TO LIMIT VOLTAGE DROP ON BRANCH CIRCUIT TO 3%

GENERAL NOTES

1. ALL WORK SHOWN IS NEW UNLESS NOTED EXISTING.
2. REMOVE ALL CONDUCTORS, DEVICES, AND CONDUIT RENDERED UNUSED BY THIS PROJECT.
3. VERIFY CIRCUITRY OF EXISTING DEVICES TO BE REMOVED PRIOR TO DEMOLITION AND PERFORM SPLICES AS REQUIRED TO MAINTAIN CONTINUITY OF CIRCUITS TO EXISTING DEVICES TO REMAIN.
4. SEAL ALL CONDUIT PENETRATIONS OF FLOORS AND FIRE RATED ASSEMBLIES WITH U.L. APPROVED MATERIALS AND METHODS TO MAINTAIN FIRE RATING.
5. PROVIDE NEW TYPEWRITTEN DIRECTORIES REFLECTING WORK PERFORMED FOR ALL EXISTING PANELBOARDS MODIFIED BY THIS PROJECT.
6. PROTECT ALL OPENINGS FOR STEEL ELECTRICAL BOXES IN FIRE RATED WALLS WITH U.L. APPROVED MATERIALS AND METHODS TO MAINTAIN THE FIRE INTEGRITY. (CBC 712.4.1.2).

SHEET LIST

E000	ELECTRICAL COVER SHEET
E100	ELECTRICAL SITE PLAN
E200	ELECTRICAL FLOOR PLANS
E300	ELECTRICAL SPECIFICATIONS

NOTE TO PLAN CHECKER

TITLE 24 COMPLIANCE FORMS NOT REQUIRED FOR TRAINING STRUCTURES.

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ALAMEDA COUNTY SHERIFF'S OFFICE — GREGORY J. AHERN

GENERAL SERVICES AGENCY — COUNTY OF ALAMEDA — GSA

General Services Agency
Capital Programs
1401 Lakeside Drive
Oakland CA, 94612

NO.	ISSUE/REVISION	YYYY-MM-DD
-	BID SET	2021-09-13

KEY PLAN

N

PROFESSIONAL SEALS

REGISTERED PROFESSIONAL ENGINEER — E15200 — ELECTRICAL — STATE OF CALIFORNIA

FACILITY
5301 Madigan Road
Dublin, ca 94568

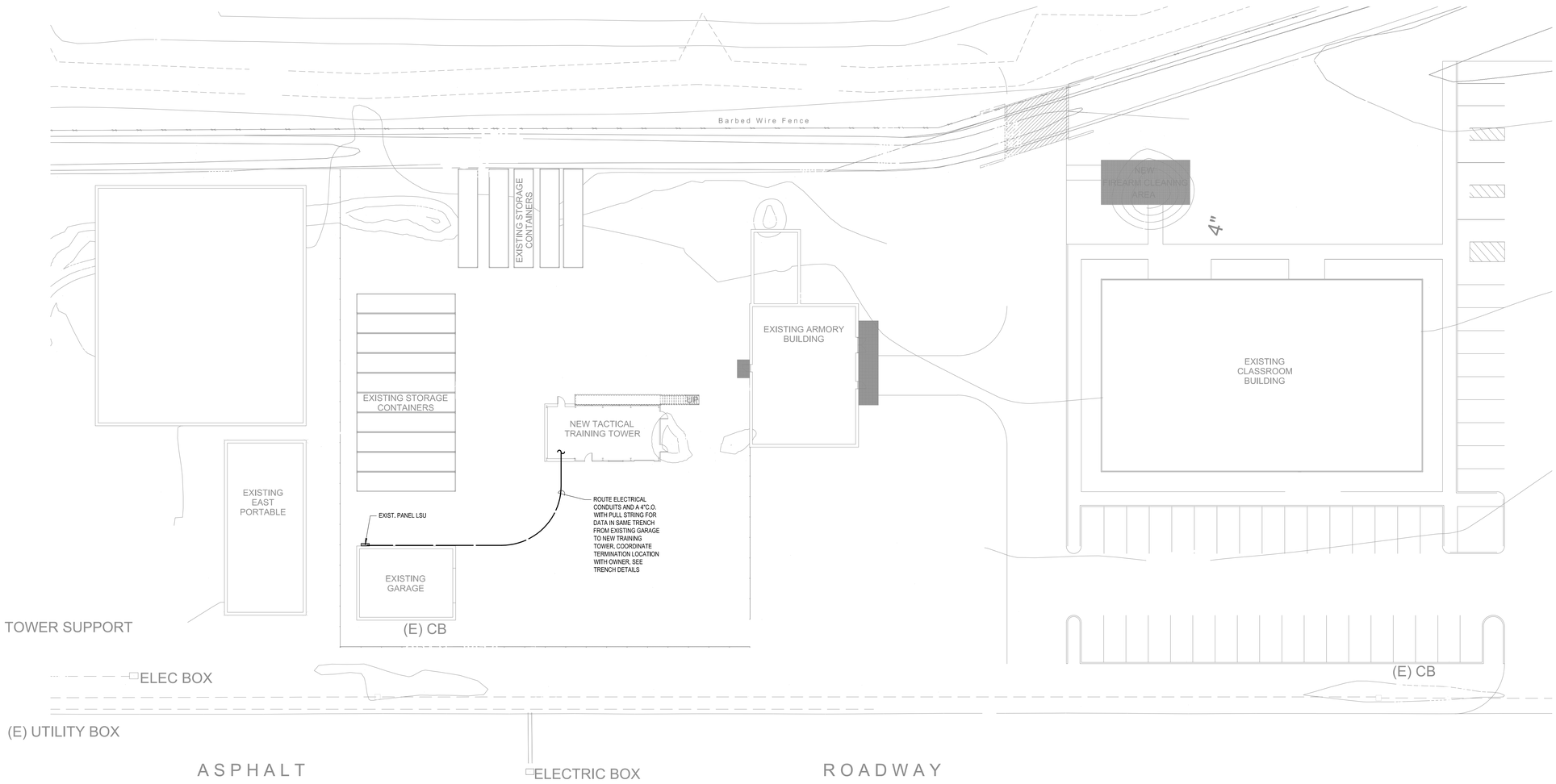
PROJECT
ASCO TACTICAL TRAINING TOWER

SHEET TITLE
ELECTRICAL
COVER SHEET

DRAWN BY	REV'D BY	SHEET NUMBER
RLA	RLA	E000

PROJECT NUMBER
SF14268.00

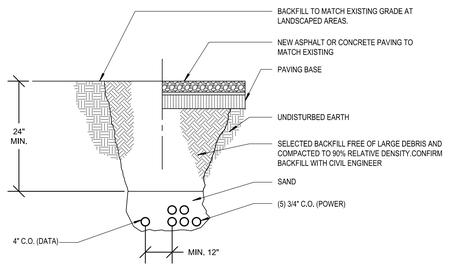
DATE
08/27/2021



EXISTING GENERAL SERVICES BUILDING

1 ELECTRICAL SITE PLAN

SCALE: 1"=20'-0"



NOTE: PROVIDE MIN. 12" OF SEPARATION BETWEEN NEW ELECTRICAL CONDUITS AND ALL OTHER EXISTING UTILITIES

2 TRENCH DETAIL

NOT TO SCALE

Existing

PANEL LSU

MOUNTING SURFACE — 10,000 A.I.C. SYM

208/120 VOLTS 3 PHASE — 4 WIRE — MAIN 100 A — BUS 100 A

VOLT AMPS ØA	VOLT AMPS ØB	VOLT AMPS ØC	DESCRIPTION	REC	LTG	OLE	BKR	CIR		CIR	BKR	OLE	LTG	REC	DESCRIPTION	VOLT AMPS ØA	VOLT AMPS ØB	VOLT AMPS ØC	
			Main			3	100	1	A	2	20	1		6	Ex. Lights & Plugs	1330			
						-	-	3	B	4	30	1			Ex. Siren		500		
						-	-	5	C	6	20	1							
750			Ex. Lights			1	20	7	A	8	30	2			Ex. AC Unit	1560			
	1080		Ex. Recepts	6		1	20	9	B	10	-	-					1560		
		1080	Ex. Recepts	6		1	20	11	C	12	20	1			Ex. Storage Cont.			500	
793			EF-4th			3	15	13	A	14	20	1			Ex. Storage Cont.	500			
	793		1-1/2 HP			-	-	15	B	16	20	1			Ex. Storage Cont.		500		
		793	6.6 FLA			-	-	17	C	18	15	3			EF-2nd			793	(1)
			Ex. Spare			1	20	19	A	20	-	-			1-1/2 HP	793			(1)
(2)	680		Tower Ded	1		1	20	21	B	22	-	-			6.6 FLA		793		(1)
(2)		680	Tower Ded	1		1	20	23	C	24	20	1			Smoke Blower			500	(2)
(2)	125		Tower Interior		5	1	20	25	A	26	20	2			Smoke Generator	1456			(1)
(2)	263		Tower Exterior		8	1	20	27	B	28	-	-					1456		(1)
(2)		1080	Tower	6		1	20	29	C	30	20	1			Ex. Spare				
1668	2816	3633	VA/LINE													5639	4809	1793	

ØA= 7306 — ØB= 7624 — ØC= 5425

LGST MTR/CONT. LOADS: 2378 x0.25= 594; 1388 x1.25= 1735

NON-CONTINUOUS LOADS: UP TO 10 kVA 4680 x1.00= 4680; RECEPTACLES; REMAINDER x0.50=; OTHER 14288 x1.00 14288

TOTAL DESIGN kVA= 21 — TOTAL DESIGN AMPS= 59

(1) Replace existing spare breaker with size/type shown.
(2) Reuse existing spare breaker.

9/17/21

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General Services Agency
Capital Programs
1401 Lakeside Drive
Oakland CA, 94612

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KEY PLAN

PROFESSIONAL SEALS

E15200 — LICENSED PROFESSIONAL ENGINEER — ELECTRICAL — STATE OF CALIFORNIA

FACILITY
5301 Madigan Road
Dublin, ca 94568

PROJECT
ASCO TACTICAL TRAINING TOWER

SHEET TITLE
ELECTRICAL
SITE PLAN

DRAWN BY	REV'D BY	SHEET NUMBER
RLA	RLA	E100

PROJECT NUMBER
SF14268.00

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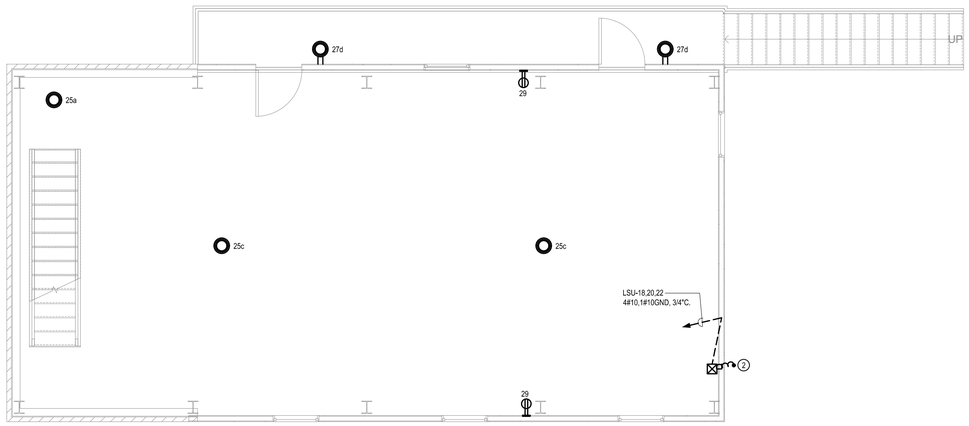
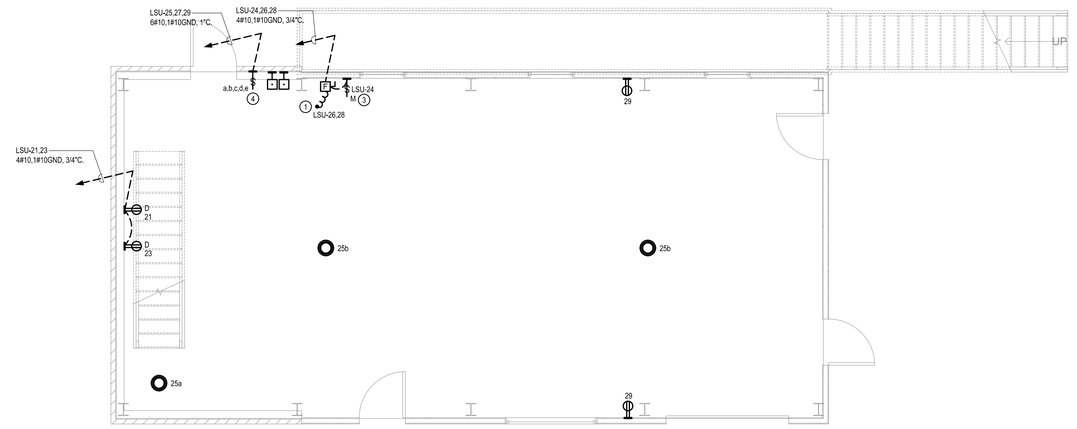


2 ELECTRICAL PLAN LEVEL 02

SCALE: 1/4"=1'-0"



1 ELECTRICAL PLAN LEVEL 01

SCALE: 1/4"=1'-0"

4 ELECTRICAL PLAN LEVEL 04

SCALE: 1/4"=1'-0"

3 ELECTRICAL PLAN LEVEL 03

SCALE: 1/4"=1'-0"

KEYNOTES

A. ALL OUTLETS TO BE GFCI WITH WEATHER PROOF CONVER.

B. ALL WIRING IN STRUCTURE TO BE #10 AWG IN SURFACE MOUNTED CONDUIT TO DEVICES SHOWN.

(1) CONNECT TO SMOKE GENERATOR AS REQUIRED. CONFIRM 208 VOLT MODEL SUPPLIED.

(2) CONNECT TO EXHAUST FAN AS REQUIRED. PROVIDE PUSH BUTTON ON/OFF REMOTE START AT TOWER DOOR.

(3) CONNECT TO SMOKE BLOWER FAN AS REQUIRED. MANUAL MOTOR STARTER TO BE CONTROL SWITCH.

(4) LABEL SWITCHES TO IDENTIFY LIGHTS AND FAN CONTROLLED.

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KEY PLAN

N

PROFESSIONAL SEALS

LA COUNTY PROFESSIONAL ENGINEERS ASSOCIATION E15200 ELECTRICAL STATE OF CALIFORNIA

FACILITY
5301 Madigan Road
Dublin, ca 94568

PROJECT
ASCO TACTICAL TRAINING TOWER

SHEET TITLE
ELECTRICAL
FLOOR PLANS

DRAWN BY	REV'D BY	SHEET NUMBER
RLA	RLA	E200

PROJECT NUMBER
SF14268.00

DATE
08/27/2021

BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.1 POWER AND CONTROL WIRING

A. Provide power system conduit and wiring to mechanical equipment. Controls system conduit and wiring for mechanical systems is included under Mechanical. "Power" wiring includes line voltage wiring from distribution apparatus to disconnecting means provided or installed under this section, and from such disconnecting means to motors, and to terminal boxes of 'package' equipment. "Controls" wiring includes wiring, regardless of voltage, which provides start-stop control for mechanical equipment and/or which is used to monitor functions of mechanical systems. Where line voltage wiring is extended from a local disconnecting means to relays, thermostats, by-pass timers, starter coils or the like, or from mechanical control panels or motor control centers to control devices, such extensions are considered "controls" wiring.

1.2 MOUNTING HEIGHTS

A. Mounting heights specified and drawn are to the center line of devices and equipment except where noted otherwise.

1.3 SUBMITTALS

A. Within thirty (30) days after award of contract, submit shop drawings, product data and wiring diagrams. Do not install materials or equipment until written approval has been obtained from Architect.

Before submitting, check submittals to ascertain that materials and equipment meet all requirements of plans and specifications and conform to structural and space conditions. Mark submittal sheets covering several types of sizes of equipment to indicate clearly specific equipment being proposed.

B. Shop Drawings: Make shop drawings to scale, showing overall dimensions and other dimensions required for proper installation of equipment. Identify clearly each item on drawings to show piece of equipment it represents.

C. Product Data: Submit catalog cuts or manufacturers' data sheets.

D. Wiring Diagrams: Submit wiring diagrams. Schematic, line to line type, using standard symbols and with components arranged in logical sequence, so that system operation can be checked easily. Where special symbols are used or where function of components is not obvious, include suitable legend or functional guide. Number all terminals for external wiring connections on diagrams.

E. Make submittals sufficiently complete to show compliance with specified features and standards.

1.4 REGULATORY REQUIREMENTS

A. Conform to:

1. California Code of Regulations, Title 8, Chapter 4, subchapter 5, Electrical Safety Orders;
2. California Code of Regulations, Title 24, Part 2, [Chapter 2-53, Energy Conservation in New Building Construction;] [California Building Code;]
3. California Code of Regulations, Title 24, Part 3, California Electrical Code;
4. City of San Francisco Electrical Code;
5. NFPA-70 - National Electrical Code;
6. Uniform Building Code.
7. Varian Building Standards

B. When conflict exists between two or more governing codes, comply with the stricter requirement.

C. Obtain permits, and request inspections from authority having jurisdiction.

1.5 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on Drawings, unless prevented by Project conditions. Coordinate installation of work in available space with work furnished under other Divisions.

1.6 PRODUCTS

A. Where manufacturer's model or series numbers are specified or shown, these indicate generally acceptable types required. Furnish products which comply with all requirements, as specified or shown.

B. When more than one unit of the same class of equipment is required, provide units produced by a single manufacturer.

1.7 TESTS

A. Furnish test equipment, facilities, and technical personnel required to perform field tests.

B. At completion of job, check voltage at several points of utilization on the system. Energize all loads installed.

1.8 CLEANING

A. After other work such as sanding, painting, etc., has been completed, clean lighting fixtures, panelboards, and other electrical equipment to remove dust, dirt, grease, or other marks, and leave work in clean condition.

1.9 RECORD DRAWINGS

A. Upon completion of the Work, deliver to Architect an up-to-date set of "as-built" record drawings on a reproducible medium.

1.10 DEMOLITION

A. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Architect/Engineer before disturbing existing installation.

B. Beginning of demolition means installer accepts existing conditions.

C. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.

D. Remove abandoned wiring to source of supply.

E. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

F. Provide blank cover for abandoned outlets which are not removed.

G. Repair adjacent construction and finishes damaged during demolition and extension work.

H. Maintain continuity of circuits which remain in service.

I. Clean existing materials and equipment which are to be reused. Report damage or defects to the Architect/Engineer.

J. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

K. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, drivers, and broken electrical parts.

PART 2 PRODUCTS

Not Used

PART 3 PART 3 EXECUTION

Not Used

END OF SECTION

BASIC MATERIALS AND METHODS

1. PART 1 GENERAL

1.1 REFERENCES

A. ANSI C80.1 Rigid Steel Conduit, Zinc Coated.

B. ANSI C80.3 Electrical Metallic Tubing, Zinc Coated.

C. ANSI/NEMA FB1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Support.

D. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

E. ANSI/NFPA 70 National Electrical Code.

F. NECA "Standard of Installation."

G. NEMA ICS 2 - Industrial Control Devices, Controllers and Assemblies.

H. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

I. NEMA KS 1 - Enclosed Switches.

J. NEMA PB 1 - Panelboards.

M. NEMA 250 - Enclosures for Electrical Equipment (1000 volts maximum).

N. ANSI/NEMA ST 20 – Dry Type Transformers for General Applications.

O. E. NEMA TP1, CSA 802.2, EPA Energy Star.

1.2 PERFORMANCE REQUIREMENTS

A. Provide support system for equipment and conduit, including wiring, with a minimum safety factor of 4. For empty conduits, include weight of 4 type XHHW wires of maximum permissible size.

1.3 QUALITY ASSURANCE

A. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

2. PART 2 PRODUCTS

2.1 CONDUIT

A. General
1. Underground Installations

a. Outside Building Foundation: Use encased burial duct and Schedule 40 PVC in concrete encasement; use PVC-coated metal conduit and Schedule 40 PVC for direct burial.

b. Under Slab on Grade: Use Schedule 40 PVC and PVC-coated metal conduit.
a. Use PVC coated metal conduit for bends greater than 30 degrees in conduits one inch trade size and larger, except where not allowed by the serving utility company.

1. Exposed Wet Locations: Use rigid steel and intermediate metal conduit.

3. Exposed Dry and Damp Locations:
a. Use rigid steel, intermediate metal conduit, below switch height and electrical metallic tubing above switch height, except that electrical metallic tubing may be used below switch height in designated equipment rooms and closets, utility chases, and similar locations.

2. Concealed Locations:
a. Furred, Ceiling Spaces and Stud Walls: Use electrical metallic tubing.
b. Connections to Lighting Fixtures in Accessible Ceilings: Use flexible conduit.

3. Equipment Connections:
a. Damp and Wet Locations and For Connections to Liquid-Handling Equipment in Dry Locations: Use liquid-tight flexible conduit.
b. Equipment for Dry Systems in Dry Locations: Use flexible conduit.

B. Metal Conduit

1. Rigid Steel Conduit: ANSI C80.1.
2. Intermediate Metal Conduit (IMC): Threaded, zinc-coated rigid steel.
3. Fittings and Conduit Bodies:
a. ANSI/NEMA FB1; threaded steel or malleable iron.

C. Flexible Metal Conduit

1. Description: Zinc-coated, interlocked steel construction.
2. Fittings: ANSI/NEMA FB 1; steel or malleable iron clamp or squeeze type, or pressure cast screw-in type. Do not use die-cast, set-screw, or sheet metal screw-in type.

D. Liquidtight Flexible Metal Conduit

1. Description: Galvanized interlocked steel construction with PVC jacket.
2. Fittings: ANSI/NEMA FB 1; steel or malleable iron, watertight type.

E. Electrical Metallic Tubing (EMT)

1. Description: ANSI C80.3; zinc-coated tubing with protective enamel coating on inside.
2. Fittings and Conduit Bodies:
a. ANSI/NEMA FB 1.
b. Concrete-tight steel or malleable iron, or pressure-cast body with steel or malleable iron nuts.
c. Compression type for 2 inch trade size and smaller, use compression or set-screw type for 2-1/2 inch trade size and larger.

F. Nonmetallic Conduit

2. Schedule 40 PVC: NEMA TC 2.

2.2 BUILDING WIRE AND CABLE

A. Conductors

1. Description: Single conductor, insulated wire.
2. Conductor: Copper
3. Insulation Voltage Rating: 600 volts.
4. Insulation: ANSI/NFPA 70, Type THHN/THWN for sizes 2 and smaller, Type XHHW for sizes #1 and larger.

B. Wiring Connectors

1. Spring Wire Connectors: Corrosion-resistant, live-action spring in insulated shell, rated 105o C.
2. Compression Connectors and Lugs: Circumferential (non-indenter) type.
3. Watertight Splice Kits: Epoxy resin or shrinkable type suitable for the type, size and number of conductors being spliced.

2.3 BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.

1. Device, Luminaire and Equipment Supporting Boxes: Minimum 4 inch square and 1-1/2 inches deep; rated for weight of equipment supported; include 1/2 inch male fixture studs where required.
2. Concrete Ceiling Boxes: 4 inch octagonal.

C. Sheet Metal Pull and Junction Boxes: NEMA OS 1, screw cover, minimum 4 inch square and 1-1/2 inches deep galvanized steel or gray baked enamel finish.

D. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat flanged, surface mounted junction box.

1. Material: Cast aluminum.
2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

E. In-Ground Cast Metal Box: NEMA 250, Type 6, [outside] [inside] flanged, recessed cover box for flush mounting.

1. Material: Cast aluminum.
2. Cover: [Smooth] [Nonskid] cover with neoprene gasket and stainless steel cover screws.
3. Cover Legend: ELECTRIC

2.4 WIRING DEVICES

A. Wall Switches: Specification grade; 120-277 volts, AC; 20 amperes.

1. Arrow Hart 1990 Series.
2. Bryant 4900 Series.
3. General Electric GE 5900 Series.
4. Hubbell 1220 Series.
5. Leviton 1221 Series.
6. Pass and Seymour 20 ACI Series.

B. Wall Dimmers: Type, voltage and load as required on Drawings.

1. Wattstopper.

C. Receptacles

1. Duplex Convenience Receptacle, Type 5-20R, Specification Grade:

a. Arrow Hart #5362.
b. Bryant #5362.
c. General Electric #GE 4108.
d. Hubbell #5362.
e. Leviton #5362.
f. Pass and Seymour #5362.

2. GFCI Receptacle, Type 5-20R, Specification Grade:

a. Arrow Hart #GF5342.
b. Bryant #GFR53.
c. General Electric #GF 5342.
d. Hubbell #GF-5362.
e. Leviton #6898.
f. Pass and Seymour #2091-S.

5. Device Body: White plastic.

D. Wall Plates

1. Decorative Cover Plate:

a. White smooth plastic.
b. Manufacturer: Same as wiring device.

2.5 CABINETS

A. Boxes: Galvanized steel.

B. Box Size: As shown on drawings.

C. Provide 3/4 inch thick plywood backboard mounting terminal blocks. Paint matte white.

D. Cabinet Fronts: Steel, flush orsurface type as shown on drawings with concealed trim clamps, concealed hinge and flush lock: Finish with gray baked enamel.

2.6 SUPPORTS

A. Support Channel: Galvanized or painted steel.

B. Hardware: Corrosion resistant.

2.7 IDENTIFICATION MATERIALS

A. Nameplates: Engraved three layer laminated plastic, white letters on a black background.

B. Wire and Cable Markers: Plastic impregnated cloth or epoxy film markers, split sleeve, or tubing type.

C. Box and Pull Line Markers: Cloth, vinyl or paper with vinyl overlay.

2.8 DISCONNECT SWITCHES

A. Acceptable Manufacturers:

1. General Electric
2. ITE
3. Schneider
4. Eaton

B. Fusible Switch Assemblies: Heavy duty, quick make, quick break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: Designed to accommodate Class R fuses.

C. Nonfusible Switch Assemblies: Heavy duty, quick make, quick break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

D. Enclosures: NEMA KS 1; Type 3R outdoors.

E. Switch Ratings: Voltage and current ratings, number of poles as shown on plan or as required by equipment or feeder controlled by switch. Provide solid neutral for switches installed on a circuit including a neutral conductor.

2.9 FUSES

A. Acceptable Manufacturers:

1. Buss
2. Economy
3. Shawmut

B. Fuses 600 Amperes and Less: UL Class RK5 with time delay for motor circuits.

C. Interrupting Rating: 200,000 rms amperes.

D. Provide fuses with voltage and current ratings suitable for equipment controlled. Where current ratings are not shown on plans, provide fuses with rating recommended by equipment manufacturer(s).

2.10 PANELBOARDS

A. Acceptable Manufacturers:

1. Match existing.

A. Molded Case Circuit Breakers: Bolt on type ambient-compensated thermal magnetic trip circuit breakers, with factory assembled common trip handle for multiple pole units. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled on Drawings.

J. Provide lugs with approved connectors for size of conductors feeding panel. Provide double lugs and extra gutter space for parallel feeder conductors.

2.11 MOTOR STARTERS

A. Acceptable Manufacturers:

1. General Electric
2. Schneider
3. Siemens
4. Eaton

B. Manual Motor Starters

1. Fractional Horsepower Manual Starter: General purpose, Class A, manually operated, full voltage controller for fractional horsepower induction motors, with thermal overload unit, and toggle operator.

2. Voltage, Rating and Thermal Element: As required by motor controlled.

3. Enclosure: NEMA ICS 6; Type 1, indoor dry locations.

D. Controller Overcurrent Protection and Disconnecting Means

1. Motor Circuit Protector: Circuit breakers with integral instantaneous magnetic trip in each pole.

2.12 PULL LINE

A. 1/8 inch diameter braided yellow polypropylene.

3. PART 3 EXECUTION

3.1 INSTALLATION

A. Conduit

1. Install conduit in accordance with NECA "Standard of Installation."
2. Do not combine more than two individual homeruns (6 circuits total) into common conduit.
3. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports
4. Arrange conduit to maintain headroom and present neat appearance.
5. Install conduit to preserve fire resistance rating of partitions and other elements.
6. Do not attach conduit to ceiling support wires.
7. Use conduit hubs to fasten conduit to cast boxes.
8. Provide insulated equipment ground conductor in flexible conduit.
9. Make conduit penetrations of exterior concrete or masonry wall below grade, and of floor slabs on fill below grade watertight.
10. Seal underground conduits terminating inside building below grade after installation of conductors; install plugs or caps in such spare (unused) conduits.

B. Building Wire and Cable

1. Use conductor not smaller than 12 AWG for power and lighting circuits.
2. Neatly train and lace wiring inside boxes, equipment, and panelboards.

3. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
4. Use hardened and tempered steel, tin-plated or stainless steel Belleville washer with slightly larger tin-plated mild steel flat washer for aluminum lugs.
5. Use compression connectors for copper conductor splices and taps, 6 AWG and larger. Use compression tool designed for the size and type of connector being compressed.
6. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 8 AWG and smaller.
7. Make underground splices watertight.

C. Boxes

1. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

2. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

3. Install boxes to preserve fire resistance rating of partitions and other elements; arrange boxes to meet regulatory requirements.

4. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices with each other.

5. Do not use through-walls boxes or install flush mounting boxes back to back in walls; provide minimum 6 inch separation. Provide minimum 24 inches separation in acoustic rated walls.

6. Use stamped steel bridges or bar hanger assemblies to fasten flush mounting outlet box between studs.

7. Use adjustable steel channel fasteners for hung ceiling outlet box.

8. Do not fasten boxes to ceiling support wires.

9. Support sheet metal boxes independently of conduit.

10. Use gang box where more than one device is mounted together. Do not use sectional box.

11. Plaster Rings: Use for all concealed; depth of rings as required to reach finished surfaces.

12. Coordinate trimming of openings for outlet boxes in partitions to achieve neat, closely-fitting openings.

13. Install knockout closure in unused box opening.

D. Wiring Devices

1. Install devices plumb, level, and rigidly in place.
2. Install switches with OFF position down, 2 inches to 8 inches from trim on the strike side.
3. Install wall dimmers to achieve power rating required for load shown on drawings.
4. Do not share neutral conductor on load side of dimmers.
5. Install decorative plates on switch, receptacle, and blank outlets in finished areas. Use multi-gang plates for multiple devices.
6. Connect wiring devices by wrapping conductor around screw terminal.

E. Supporting Devices

1. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors, beam clamps, steel ramset fasteners.
2. Use toggle bolts or hollow wall fasteners in plaster or gypsum board partitions and walls; sheet metal screws or spring steel bar retainer clips in sheet metal studs.
3. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.
4. Do not use powder actuated anchors without specific permission.
5. Do not drill structural steel members without specific permission.
6. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under nuts.
7. Install surface mounted cabinets and panelboards with minimum of four anchors.
8. Bridge studs top and bottom with channels to support flush mounted cabinets and panelboards in stud walls.

F. Electrical Identification

1. Secure nameplates to equipment fronts using screws or rivets. Secure nameplate to inside face of recessed panelboard doors in finished locations.

2. Provide wire markers on each conductor in panelboard gutters, pull boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits If more than one neutral conductor is present, mark each with related circuit numbers.

3. Color code all secondary branch circuit and feeder conductors as follows:

a. Four Wire, Three Phase, Grounded Wye or Delta System: For 120/208 volt systems, use one black, one red, one blue, one white (neutral). For 277/480 volt systems, use one brown, one orange, one yellow and one gray (neutral).

4. Use wire with insulation of required color. For sizes of wire, which may not be available in specified colors use self adhesive wrap around, markers of solid colors to color code conductors.

5. Color code conductors at accessible locations.

6. Nameplate Engraving

a. Panelboards: 1/4 inch; identify equipment designation. 1/8 inch; identify voltage rating and source.

7. Pull Rope Marking: Affix label identifying termination point at each end of pull rope.

8. Outlets: Affix label identifying panel and circuit number.

G. Disconnect Switches

1. Install disconnect switches shown mounted on walls at +4'-6" to centerline of switch.

2. Install disconnect switches shown on or adjacent to equipment on field-fabricated galvanized steel frames.

3. Install fuses in fusible disconnect switches.

H. Panelboards

1. Install panelboards plumb. Install flush mounted panelboards flush with wall finishes.

2. Height: 6 ft. to top of panel.

3. Provide filler plates for unused spaces in panelboards.

4. Provide typed circuit directory in plastic holder for each branch circuit panelboard.

5. Stub one 3/4 inch conduit to accessible location above ceiling out of each recessed panelboard for each 3 spares or spaces.

I. Motor Starters

1. Install motor control equipment in accordance with manufacturer's instructions.

2. Select and install heater elements in motor starters to match installed motor characteristics.

3. Motor Data: Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

4. Install separately-mounted magnetic starters shown adjacent to equipment on galvanized steel frames.

J. Pull Line: Provide in each empty conduit except sleeves and nipples; leave 8 inches of slack at each outlet.

END OF SECTION

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NO.	ISSUE/REVISION	YYYY-MM-DD
-	BID SET	2021-09-13

KEY PLAN

N

PROFESSIONAL SEALS

REGISTERED PROFESSIONAL ENGINEER RICHARD L. LAMB E15200 ELECTRICAL STATE OF CALIFORNIA

FACILITY

5301 Madigan Road
Dublin, ca 94568

PROJECT

ASCO TACTICAL TRAINING TOWER

SHEET TITLE

ELECTRICAL SPECIFICATIONS

DRAWN BY	REV'D BY	SHEET NUMBER
RLA	RLA	E300

PROJECT NUMBER

SF14268.00

DATE

08/27/2021